

**James Madison University, Department of Mathematics and Statistics**  
**Linear Algebra with Differential Equations – Math 238.4,5, Spring 2012**

Section 4: MWF 1:25-2:15 Roop 212, Th 12:30-1:45 Burruss 141

Section 5: MWF 2:30-3:20 Roop 212, Th 2:00-3:15 Burruss 141

**Overview:** Math 238 introduces some of the concepts of linear algebra and methods for solving differential equations. Our aim is to be comfortable manipulating matrices and determinants, vector spaces, linear transformations, eigenvalues and eigenvectors, solving first order differential equations, linear and systems of linear differential equations, and seeing some application areas.

**Prerequisite:** Math 236

**Instructor:** Dr. Stephen Lucas.

**To contact me:** In person: Roop 112 Phone: 568-5104, Email: [lucassk@jmu.edu](mailto:lucassk@jmu.edu). Office hours: W 11:00-1:00, Th 3:30-4:15, F 9:00-10:00.

**Website:** We will be using Blackboard as the course website, with selected homework and exam solutions.

**Textbook:** *Linear Algebra and Differential Equations*, G. Peterson and J. Sochacki, Addison Wesley 2002.

**Calculators:** You may use any calculator you like which **does not** perform symbolic manipulation, like a TI-89 or a TI-92. An ordinary scientific or graphics calculator is acceptable, although the graphics capability is unlikely to be useful.

**Homework, Exams and Grading:** There will be new material presented every class, with as ample time for review and discussion of homework. Homework will be set every class, with an opportunity to review and ask questions the next class. All homework for the previous week should be submitted at the beginning of class Wednesday morning, stapled and with your name in the top right corner of the first page. Some problems will be chosen at random (using dice) and graded. Homework questions will be worth 15% of your final grade. There will also be three one-hour tests during the semester (with review sessions beforehand), each also worth 15% each. Each test will roughly cover two chapters of the textbook. The final comprehensive exam is worth 35%. Finally, a project will be assigned in the middle of the semester worth 5%. It will involve research into an application of linear algebra or differential equations and a poster presentation at the end of the semester.

Final grades will be somewhat related to A=85+, B=65+, C=50+, but will vary depending on the class average and natural divisions between raw scores. Borderline cases will be decided based upon class participation, effort, and performance throughout the semester.

**Attendance:** Attendance is not mandatory. However, past experience suggests there is an extremely strong correlation between attendance and passing, and I would prefer you to turn up to every class. If you cannot make a class and hand in homework, please give to a classmate to give to me on the day. If you miss handing in homework or taking a test without previously getting my permission, you will receive a zero for that homework or test. If there is a medical emergency and you cannot inform me beforehand, let me know as soon as possible.

**Getting Help:** If you need help, ask! The worst thing you can do in a math course is let things slide, since earlier material will be assumed knowledge later. We will have question time regularly through the class, which I encourage you to use. You can also attend my office hours or contact me via email. If you want to see me outside office ours, please make an appointment – I can't guarantee that I will be available if you come and knock on my door at a random time.

**Goals of the Course:**

1. To develop an understanding of the logical structure and style of mathematics by:
  - a. Using reason in an orderly, cogent fashion.
  - b. Writing clear, well organized solutions to problems.
  - c. Evaluating critically and using mathematical definitions.
  - d. Constructing proofs of mathematical theorems using direct and indirect arguments.

Structure refers to the foundations of mathematics and to the techniques used to build on those foundations. Style refers to the clarity, elegance, efficiency, and precision desirable in mathematical expression.

2. To develop computational skills such as:
  - a. Using matrices to solve systems of linear equations.
  - b. Determining whether a given set of vectors forms a basis for a vector space.
  - c. Determining the matrix of a linear transformation relative to given bases.
  - d. Finding eigenvalues and bases for eigenspaces of a square matrix.
  - e. Solving first-order separable and exact differential equations and linear and systems of linear differential equations.
3. To develop an understanding of the theory of linear algebra and differential equations by knowing:
  - a. The concept of a vector space and subspace.
  - b. The concepts of a spanning set, linear dependence, basis, and dimension of a vector space.
  - c. The basic concepts of matrices and linear transformations.
  - d. The basic concepts of determinants.
  - e. Existence and uniqueness of solutions to initial value problems.
  - f. The concepts about solutions of linear and systems of linear differential equations.

### Proposed Math 238 Syllabus and Homework Problems, Spring 2011

Date	Section	Homework Problems	Date	Section	Homework Problems
1: 1-M 1/9	1.1	1,2,9	Spring Break		
2: 1-W 1/11	1.1	3,7,13,17,23	29: 9-M 3/12	4.2	11,13,15,17,19,21,25,27,36
3: 1-Th 1/12	1.2	1,3,5	30: 9-W 3/14	4.3	1,3,5,17
4: 1-F 1/13	1.2	7,9,11,13,17,19,23,26,28	31: 9-Th 3/15	4.3	9,11,15,19,23,25
2-M 1/16	MLK, no class		32: 9-F 3/16	4.4	1,4,5
5: 2-W 1/18	1.3	1,5,7,9,15,16	10-M 3/19	4.5	1,3,5
6: 2-Th 1/19	1.3	11,18,20	10-W 3/21	Review	
7: 2-F 1/20	1.4	1,3,7,9,11,13,15,17,26	10-Th 3/22	Test 2	
8: 3-M 1/23	1.5	1,3,5,7,9	33: 10-F 3/23	4.5	9,15ab,16
9: 3-W 1/25	1.5 & 1.6	1.5: 11,13,16    1.6: 1,3	34: 11-M 3/26	5.1	1,2,3,5,7,13,15,17,
3-Th 1/28	1.6	7,9,14a,15,16	35: 11-W 3/28	5.1 & 5.2	5.1: 19,21    5.2: 1,3,5,23(1,3,5)
10: 3-F 1/27	2.1	1,3,7,8,9	36: 11-Th 3/29	5.3	1
11: 4-M 1/30	2.1	2,5,6,10,11	37: 11-F 3/30	5.3	3,5,9
12: 4-W 2/1	2.2	1,2,3,4,5	38: 12-M 4/2	5.4	1,3,5,7,9
13: 4-Th 2/2	2.2	9,11,13,15,17,19	39: 12-W 4/4	5.4	13,21,26
14: 4-F 2/3	2.3	1,3,5,7,9,11,17,19,21	40: 12-Th 4/5	5.5	1,3,5,7,9,13,31,32
15: 5-M 2/6	2.3	23,25,27	41: 12-F 4/6	6.1	1,3,7,11
5-W 2/8	Review		42: 13-M 4/9	6.2	1,3,5,7
5-Th 2/9	Test 1		43: 13-W 4/11	6.2	11,13,15
16: 5-F 2/10	2.4	1,2,3,16	44: 13-Th 4/12	6.3 & 6.4	6.3: 1,9    6.4: 1,5,11
17: 6-M 2/13	2.4	5,7,9,11,13,15,17	45: 13-F 4/13	6.5	1,5
18: 6-W 2/15	2.5	1,3,5,7	46: 14-M 4/16	6.6	1,3,9
19: 6-Th 2/16	3.1	1,3,5,7,9,13	14-W 4/18	Review	
20: 6-F 2/17	3.2	1,3,5,7,9,13,15	14-Th 4/20	Test 3	
21: 7-M 2/20	3.3	1,3,5,7,9,11	14-F 4/21	Snow Day	
22: 7-W 2/22	3.4	1,3,5,7,9,13,15	15-M 4/23	Snow Day	
23: 7-Th 2/23	3.6	3,7,8a,9	15-W 4/25	Snow Day	
24: 7-F 2/24	3.6	11,12,13,21	15-Th 4/26	Poster Presentations	
25: 8-M 2/27	3.7	1,3,9,18	15-F 4/27	Review	
26: 8-W 2/29	4.1	1,3,5,9	Final, Section 4: Wed 5/2 10:30. Section 5: Mon 4/30 1:00		
27: 8-Th 3/1	4.1	13,17			
28: 8-F 3/2	4.2	1,3,5,7,9			

Note that this schedule is subject to change depending upon snow and the speed with which we move through the material. Homework problems relevant to each class will be set in that class.