

**MATH 308 Differential Equations
Spring 2010**

Meeting Place: FREY 343 9:10 – 10:10 M W F

Instructor: Doug Phillippy
Phone: 2140
Office: FREY 325
Office Hours - M W F (2:30 -3:30) T Th (10:30 -11:30)

Required Course Material: Dennis G. Zill, *A First Course in Differential Equations*,
9th Edition, Brooks/Cole Publishing Company, Boston, 2009.

Course objectives:

1. To develop the ability to solve an ordinary differential equation of first or second order.
2. To develop the ability to model certain physical phenomenon using ordinary differential equations.
3. To develop an ability to analyze a differential equation by using numerical or graphical techniques.
4. To enhance learning by examining geometric, numerical, and algebraic aspects of each problem.
5. To acquire an understanding of the breadth of mathematics by introducing applications in a wide variety of scientific fields.
6. To enhance the ability to communicate mathematical concepts through a series of written laboratory assignments and classroom discussions.
7. To select and use technology when appropriate in problem solving.
8. To develop the process of making appropriate conjectures, finding suitable means to test those conjectures, and drawing conclusions about their validity.

Prerequisites by topic: MAT 211 (Calculus III) or equivalent

1. Understand and use the fundamental theorem of calculus.
2. Familiarity with integration by parts and partial fractions.
3. Understand the concept of a vector field.
4. Familiarity with power series and regions of convergence.
5. Ability to use a computer algebra system or graphics calculator.
6. Ability to analyze functions and their graphs.
7. Understand partial differentiation.

Topics:

1. First-order differential equations: A) separable variables, B) homogeneous equations, C) exact equations, D) linear equations, E) integrating factors, F) Bernoulli equations.
2. Second-order differential equations: A) reduction of order, B) undetermined coefficients, C) variation of parameters.
3. Homogeneous differential equations: A) linear independence, B) differential operators, C) annihilator approach.

4. Laplace transforms and their applications to solving differential equations.
5. Numerical and graphical methods: A) orthogonal trajectories, B) direction fields, C) Euler's method.
6. Applications: A) simple harmonic motion, B) damped and forced motion, C) electrical systems, D) mixture problems, E) population growth, F) radioactive decay.
7. Power series solutions.
8. Existence and uniqueness of solutions.

Resources:

1. The mathematics reading room (Frey 341).
2. Student math resource people available Monday through Thursday nights in Frey 341.
3. Messiah College welcomes students with disabilities. **AMERICANS WITH DISABILITIES ACT:** Any student whose disability falls within ADA guidelines should inform the instructor within the first two weeks of any special accommodations or equipment needs necessary to complete the requirements for this course. Students must register documentation with the Office of Disability Services (Hoffman 101). If you have questions, call extension 5382.

During each class, we will discuss material from the text. You should read each section before it is discussed. When this discussion is completed, practice problems will be assigned. Each day we will discuss the assigned homework from the previous day. This course will require roughly 2 hours of homework for each class session. Approximately one day each week there will be a short quiz. We will also make use of a Computer Algebra System (either DERIVE or Maple) as an aid to solve problems. Your attendance is expected at all class sessions. Exams may be made up only with a valid excuse, and quizzes cannot be made up. The lowest quiz grade will be dropped. Work should be handed in at the beginning of class on the date it is due. Every day that the work is late will result in a 10% reduction of your grade.

Grading:	Hour Exams (3)	300 points
	Quizzes/Homework	100 points
	Projects	100 points
	Final Exam	200 points

	TOTAL POSSIBLE	700 points
Grading scale:	<u>Course %</u>	<u>Course Grade</u>
	90%	A
	80%	B
	70%	C
	60%	D

Exceptions to this table: + and - given at instructor's discretion.

Final Exam Date – Friday May 7th at 8:00. School policy requires you to take the exam on this date. Make travel plans accordingly.

Prov 3:5-6 Trust in the LORD with all your heart and lean not on your own understanding; in all your ways acknowledge him, and he will make your paths straight.

Feb.	1	1.1	1,3,5,7,9,13,15,17,19,23,25,27,35,41,47,51,54,55,58 Read 1.3
	3	2.1.1	1,3,5,7,8,13,16 (Do problems 5,7 and 8 by hand)
	5	2.6	1,5,7,9 (do by hand only with $h=.1$)
	8	1.2	1,5,7,11,13,15,17,21,25,27,31,35,37
	10	2.1.2	19,21,25,29,35
	12	2.2	3,5,7,11,13,17,19,23,27,33,35,36,43,47
	15	2.4	3,7,9,11,15,19,21,25,27
	17	2.3,2.4	1,5,7,9,11,13,17,23,25,31,45 2.4 33,35,37,41,44
	19	2.5	1,3,5,7,11,15,17,19,21,23,25
	22	3.1	1,5,7,9,11
	24	3.1	13,15,17,19,21,25,35,43
	26	TEST 1	
March	1	3.2	1,3,5a,15
	3	4.1.1	1,5,7,9,11,13
	5	4.1.2	15,17,19,21,23,25,29
	8	4.1.3	31,33,35,39
	10	4.2	1,3,5,11,13,15,19
	12	4.3	1,5,9,13,31,33,37,41,43,45,47,49,51
	22	4.3	15,17,21,25,
	24	4.7	1,5,9,11,15,17,25,27,29,31,39
	26	5.1.1	1,5,7,11,13,15
	29	5.1.2	17,18,19,20,21,25,27
	31	Test 2	
April	7	4.4	1,3,5,7,11,13,17,21,27,31,33,43,45
	9	4.6	1,5,7,11,15,17,19,27
	12	4.9	1,3,5,7,11,13,15
	14	5.1.3	29,33,36,37
	16	7.1	1,5,7,9,11,15,19,23,25,27,29,33,35,37,41,42a,b
	19	7.2.1	1,3,7,9,11,15,19,21,25,27
	21	7.2.2	31,33,35,39,41,44
	23	7.3.1	1,5,9,11,13,17,21,25,29,33
	26	7.3.2	37,41,43,45,47,49,50,51,52,53,54,55,57,61,63,67
	28	TEST 3	
	30	No class	
May	2	7.4	1,3,5,7,9,11,15,17, 21,23,27,49,51,53
	7	Final Exam at 8:00	

* We may also cover sections 4.5, 7.5, 6.1, and 6.2 if we have some extra time.