
Department of Mathematical Sciences
ELIZABETHTOWN COLLEGE

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Office hours: Mo,Tu,We,Th, Fr 2:00-3:30pm.

SYLLABUS

TEXT: You may use either the sixth or the fifth edition:

Advanced Engineering Mathematics, by Dennis G. Zill, Warren S. Wright; JONES & BARTLETT LEARNING; Sixth edition (ISBN 9781284105902 or ISBN 9781284103229).

or:

Advanced Engineering Mathematics, by Dennis G. Zill, Warren S. Wright; JONES & BARTLETT LEARNING; Fifth edition (ISBN 9781449679774 or ISBN 9781284041620).

We will be using only the text; none of the online materials or features will be needed.

PREREQUISITES. MA 122 (Calc 2).

CALCULATOR. It is advisable to have a calculator capable of matrix operations; a graphing calculator is highly recommended. Please keep in mind that calculators might not be allowed on some tests and quizzes. Even when calculators are allowed, you must show all steps to receive full credit. I will be more specific about the calculator policy as the course progresses.

For some assignments throughout the semester, you will need to use mathematical software (such as Mathematica or Matlab) that can be accessed in the computer labs.

COURSE CONTENTS. This is a first course in differential equations with elements of Linear Algebra. We will cover about half of the book; namely Chapters 2, 3, 4, 6, 8, 10, 12, 15, and 17 of the text, omitting some sections (see the attached schedule).

STUDENT LEARNING OUTCOMES. By the end of the semester you will be able to:

- solve systems of linear equations and compute determinants, eigenvalues, and eigenvectors;
- formulate differential equation models from physical laws;
- set up second order differential equation models for oscillating systems;
- sketch solution curves using only the differential equation (no solution formula, no computer);
- identify steady-state solutions and determine the stability of these solutions;
- use basic universal numerical and analytic methods to approximate solutions of differential equations;
- solve separable differential equations via integration;
- solve first order linear equations using different methods;
- solve second order, constant-coefficient differential equations using characteristic functions, undetermined coefficients, and variation of parameter;
- compute physical quantities such as amplitude, period, natural frequency, resonant frequency, and amplitude at resonance for forced spring-mass systems;
- compute Fourier series, Fourier transforms, and Laplace transforms;
- use Laplace Transforms, Fourier Series, and Fourier Transforms to solve differential equations;
- represent higher order differential equations as first-order systems of differential equations and vice-versa;
- solve first order linear systems of differential equations with constant coefficients;
- use mathematical software to solve initial value problems;
- use transforms (e.g. FFT) to analyze frequency information in data.

ASSESSMENT. Your final grade for the course will be based on the degree of mastery of the learning outcomes listed above, as measured by performance in class, and on quizzes, tests, and the final exam.

LECTURES. This is a 4-credit course. You are supposed to spend 12 hours per week on this course. Of these, you will be spending 4 hours per week in class, in four 60-minute lectures. The other 8 hours must be devoted to studying on your own: reading the book, reading and organizing your notes, solving problems. You are expected to attend all lectures. If you miss a class, it is your responsibility to make a copy of the classnotes from another student and make sure you learn what you have missed. Excessive absences may result in a lower grade.

HOMEWORK and QUIZZES. Homework is assigned for each section of the book covered and is a required component of the course. Working the exercises is intended to help you learn, and give you some perspective on your progress. Homework will not be collected for grading, but if you do not do it regularly, you will not learn. I suggest that you keep a notebook to write the homework in (this could be the same notebook in which you write your lecture notes).

Approximately once or twice a week, there will be a short mini-quiz on one or two of the homework problems from recent assignments. The dates of the quizzes will *not* be announced in advance. The two lowest quiz grades will be dropped. A missed quiz cannot be made up.

The problems on the tests and the final exam will also be similar to (although not exactly the same as) the ones discussed in class or assigned as homework. Discipline yourself to write clear readable notes and solutions; they will be of great value as review.

EXAMS and GRADING POLICY. There will be four in-class tests, on the following dates (tentatively):

- FRIDAY, SEPTEMBER 20;
- TUESDAY, OCTOBER 22;
- THURSDAY, NOVEMBER 14;
- TUESDAY, NOVEMBER 26.

Each test is timed and will take 60 minutes. This time limit will be strictly enforced. Make up tests will not be given, except in cases of grave emergency (a permission must be obtained from me *in advance*).

There will be a comprehensive final exam on MONDAY, DECEMBER 9, 2:30 TO 5:30PM. Note that this dates and time have been set by the registrar's office and cannot be changed. Make your travel plans accordingly.

All exams and tests are closed-book. For some of them you will be given formula sheets or tables. No other books or notes of any sort are allowed. You should bring your calculator to the tests and final exam.

Your final grade will be calculated in the following way:

- 55% of the grade come from the four Tests, (15% each for the three best tests, and 10% the worst),
- 30% of the grade come from the Final Exam,
- 15% of the grade come from the quizzes (two worst dropped).

These scores are combined to give a final number of points, between 0 and 100. Point ranges for the final grades are:

A	93-100
A-	90-92.9
B+	87-89.9
B	83-86.9

B-	80-82.9
C+	77-79.9
C	73-76.9
C-	70-72.9

D+	67-69.9
D	63-66.9
D-	60-62.9
F	0-59.9

SCHOOL CLOSURE POLICY. Occasionally, the college is closed and classes are cancelled due to inclement weather or other emergency situations. To minimize the negative impact of such disruptions on your learning, the following School Closure Policy will be in effect for this course. In case of school closure, an alternative form of the lecture will be provided (voice-over slides, instructional video,

additional assigned reading, or a combination of these), and you will still need to complete the homework assignment. Concrete details will be communicated to you at the time of the closure announcement. In case the closure falls on an exam day, an alternative date and time for the exam will be announced.

INTEGRITY. All work you submit for grading must be your own and must comply with the Standards of Integrity set forth in the Elizabethtown College Catalog. In particular, no collaboration on quizzes or exams is allowed.

DISABILITIES. Elizabethtown College welcomes otherwise qualified students with disabilities to participate in all of its courses, programs, services, and activities. If you have a documented disability and would like to request accommodations in order to access course material, activities, or requirements, please contact the Director of Disability Services, Lynne Davies, by phone (717-361-1227) or e-mail daviesl@etown.edu.

If your documentation meets the college's documentation guidelines, you will be given a letter from Disability Services for each of your professors. Students experiencing certain documented temporary conditions, such as post-concussive symptoms, may also qualify for temporary academic accommodations and adjustments.

As early as possible in the semester, set up an appointment to meet with me, the instructor, to discuss the academic adjustments specified in your accommodations letter as they pertain to my class.

STATEMENT ON RELIGIOUS OBSERVANCES. The College is eager to facilitate individual religious beliefs and practices whenever possible while retaining course student learning outcomes. It is your responsibility to meet with the class instructor in advance to request arrangements related to your religious observances that may conflict with this class, and to make appropriate plans to make up any missed work.

The most current college policies on Disability Services and Religious Observances can be found at this [link](#).

The following is a tentative schedule. Most of the time we will follow it closely, but deviations are to be expected.

MA321, Spring 2015

SCHEDULE

Day	Date	Topic	Sect.	Problems	Due
		COMPLEX NUMBERS			
Mo	08/26	Complex Numbers	17.1	1,9,15,33,37	08/27
Tu	08/27	Powers and Roots	17.2	7,9,15,25,31	08/29
Th	08/29	Exponential and Logarithmic Functions	17.6	1,13,27,29,41	08/30
Fr	08/30	Trigonometric and Hyperbolic Functions	17.7	3,11,15,17,21	09/03
		MATRICES			
Tu	09/03	Matrix Algebra	8.1	11,15,17,23,35	09/05
Th	09/05	Systems of Linear Algebraic Equations	8.2	1,9,11,13,19	09/06
Fr	09/06	Rank of a Matrix	8.3	7,9,11,13,19	09/09
Mo	09/09	Determinants	8.4	1,5,7,21,27	09/10
Tu	09/10	Properties of Determinants	8.5	11,13,17,25,29	09/12
Th	09/12	Inverse of a Matrix	8.6	3,19,27,31,49	09/13
Fr	09/13	Cramer's Rule	8.7	1,3,5,7,9	09/16
Mo	09/16	The Eigenvalue Problem	8.8	3,7,15,17,21	09/17
Tu	09/17	Diagonalization	8.12	1,11,23,27,39	09/19
Th	09/19	Review			
Fr	09/20	TEST 1			

(continued on next page)

Day	Date	Topic	Sect.	Problems	Due
		FIRST ORDER ODEs			
Mo	09/23	Slope Fields, Solution Curves	2.1	1,9,19,21,27	09/24
Tu	09/24	Separable Equations	2.2	3,11,19,23,29	09/26
Th	09/26	Linear Equations	2.3	3,9,23,25,29	09/27
Fr	09/27	Exact Equations	2.4	3,7,27,29,31	09/30
Mo	09/30	Solutions by Substitutions	2.5	3,7,11,15,21	10/01
Tu	10/01	More Substitutions	2.5	13,17,23,27,29	10/07
		HIGHER ORDER ODEs			
Mo	10/07	Theory of Linear ODEs	3.1	3,9,15,23,35	10/08
Tu	10/08	Reduction of Order	3.2	1,3,7,13,19	10/10
Th	10/10	Hom. Lin. ODEs with Const. Coeffs.	3.3	1,5,15,31,37	10/11
Fr	10/11	Undetermined Coefficients	3.4	3,7,19,29,37	10/14
Mo	10/14	Variation of Parameters	3.5	3,5,11,19,21	10/15
Tu	10/15	Cauchy-Euler Equations	3.6	1,5,19,25,31	10/17
Th	10/17	Applications: IVPs	3.8	1,7,21,29,45	10/18
Fr	10/18	Applications: BVPs	3.9	1,3,7,11,17	10/21
Mo	10/21	Review			
Tu	10/22	TEST 2			
		LINEAR SYSTEMS of ODEs			
Th	10/24	Theory of Linear Systems	10.1	11,13,17,23,25	10/25
Fr	10/25	Homogeneous Linear Systems	10.2	1,5,23,27,39	10/28
Mo	10/28	Solution by Diagonalization	10.3	1,3,5,7,9	10/29
Tu	10/29	Nonhomogeneous Linear Systems	10.4	3,7,9,25,37	10/31
Th	10/31	Matrix Exponential	10.5	1,3,5,7,9	11/01
		LAPLACE TRANSFORMS			
Fr	11/01	Definition of the Laplace Transform	4.1	1,3,13,19,25	11/04
Mo	11/04	Solving ODEs with Laplace Transforms	4.2	1,3,5,31,33	11/05
Tu	11/05	Translation Theorems	4.3	3,13,27,37,45	11/07
Th	11/07	Additional Operational Properties	4.4	7,13,21,39,57	11/08
Fr	11/08	The Dirac Delta Function	4.5	1,3,5,9,11	11/11
Mo	11/11	Systems of Linear ODEs	4.6	1,3,5,7,9	11/12
Tu	11/12	Review			
Th	11/14	TEST 3			
		FOURIER SERIES and TRANSFORMS			
Fr	11/15	Orthogonal Functions	12.1	3,5,7,13,19	11/18
Mo	11/18	Fourier Series	12.2	1,3,5,11,13	11/19
Tu	11/19	Fourier Cosine and Sine Series	12.3	11,13,25,32,39	11/21
Th	11/21	Fourier Transforms	15.4	1,3,5,7,15	11/22
Fr	11/22	Fast Fourier Transform	15.5	1,3,7	11/25
Mo	11/25	Review			
Tu	11/26	TEST 4			
		NUMERICAL SOLUTIONS of ODEs			
We	11/27	Euler Methods and Error Analysis	6.1	1,3,5,9,11	12/02
Mo	12/02	Runge-Kutta Methods	6.2	1,3	12/03
Tu	12/03	Multistep Methods	6.3	3,5	12/05
Th	12/05	Higher-Order Equations and Systems	6.4	1,3	12/06
Fr	12/06	Second-Order Boundary-Value Problems	6.5	1,3,5,7,9	
Mo	12/09	FINAL EXAM (TH105, 2:30-5:30pm)			