**MTH 335**

**Differential Equations**

**Spring 2014**

**Text and calculator**

A First Course in Differential Equations (hardcover) by J. David Logan 2/e

A scientific calculator is needed, preferably one that performs numerical integration and has graphing capabilities.

**Computer requirements**

You need to have access to the University’s computers, which you should if you are a registered student. We will occasionally need to use MATLAB or Mathematica.

**Instructor**

Dr. Clayton Brooks

Office: Smith Hall 723

Office hours: M – F 12:00 – 1:00, or by appointment

E-mail: brooksc at marshall.edu

Telephone: The University does not give me full telephone access so I may not be able to return your call. So, with that in mind, my number is ×6-6702.

**Course description**

MTH 335 - Differential Equations. 4 hrs.

First and second-order ordinary differential equations. Applications include vibrations and electrical circuits. Laplace transform, approximate solutions, orthogonal functions, Fourier series; partial differential equations including heat, wave, and Laplace equations. (PR: *C* or better in MTH 231 and REC: MTH 331 or MTH 329)

**Learner outcomes**

The student is expected to be able to:

* Identify a differential equation.
* Understand the concept of a solution to a differential equation.
* Determine if something is a solution to a differential equation.
* Draw graphs representing differential equations and their solutions.
* Solve pure time equations.
* Set up differential equations to model situations in various disciplines.
* Solve by the method of separation of variables.
* Solve first order linear equations.
* Approximate solutions to first order differential equations.
* Solve second order linear differential equations with constant coefficients.
* Solve nonhomogeneous equations based on results from related homogeneous ones.
* Solve a Cauchy-Euler equation.
* Find power series solutions.
* Use reduction of order techniques.
* Use variation of parameters technique.
* Solve second order boundary value problems.
* Solve a selection of higher order differential equations.
* Use Laplace Transforms to solve differential equations.
* Solve systems of differential equations using eigenvalues.

**Assessment of learner outcomes**

The student will be expected to:

* Answer questions that determine basic comprehension of concepts.
* Interpret results given data or graphs.
* Analytically solve differential equations.
* Numerically solve differential equations.
* Graph results or functions.
* Interpret results.
* Apply concepts to find solutions to a situation.

This will be demonstrated by the results of quizzes, homework, small projects, a midterm exam, and a final exam.

The exams will consist of a portion that does not allow a calculator or other technology, and a portion that will require a calculator.

No sharing of calculators or other technology during a test is allowed.

**Grading policy**

The weights given to aspects of the class are:

40% Midterm exam

40% Final exam

20% Quizzes and other assignments

A letter grade, or its equivalent on a 90-80-70-60 scale, will be given for each aspect. The final grade will be an average of those aspects.

**Late penalties**

A penalty of 1% reduction for each hour late will be assessed for any assignment. Make-up tests will not be given for any unexcused absence.

**Attendance policy**

There is no formal attendance policy. However, being absent for exams and class presentations and discussions inherently carries potentially severe penalties.

**Course philosophy**

The basic idea is to introduce the student to a dynamic world, as opposed to the static world of algebra and lower level mathematics. Using many of the concepts from calculus, the student model dynamic situations, study equations and solutions from those situations, and develop an appreciation of the complexity of attempting to find solutions.

**Teaching outline**

Week of:

January 14: Chapter 1 (Introduction to differential equations and models)

January 21 Chapter 1

January 28: Chapter 2 (Linear equations: solutions and approximations)

February 4: Chapter 2

February 11: Chapter 3 (Second-order differential equations)

February 18: Chapter 3

February 25: Chapter 4 (Laplace Transforms)

March 4: Midterm exam on March 6

March 11: Chapter 4

March 25: Chapter 4

April 1: Chapter 5 (Systems of differential equations)

April 8: Chapter 5

April 15: Chapter 6 (Linear systems and matrices)

April 22: Chapter 6

April 29: Catch-up, review, or other small projects.

The Final Exam is on Thursday, May 8, 12:45 – 2:45