

**MATH 305: Introduction to Differential Equations**  
**Spring 2011                      Section 001                      3 credit hours**

**Instructor:** Dr. Trent Kull

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**Instructor Website:** <http://faculty.winthrop.edu/kullt/>

**Instructor's Teaching Schedule:** MW, 2 - 3:15p,  
Owens 203

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**Office Hours:** MW, 3:30 - 5p  
F, 8:15 - 9:15a  
Other times by appointment.

### Modifications

The instructor reserves the right to make modifications to this syllabus. Students will be notified in class & by email.

### Course Content

The study of differential equations involves determining solutions to equations containing one or more derivatives of an unknown function. These equations have applications in many fields, including engineering, biology, and economics, where basic principles are often characterized by information obtained about applicable rates of change (derivatives). In this course, students will (primarily) study first and second order, linear, ordinary differential equations, Laplace transform solution techniques, and ordinary linear systems. For the entire course, a comfortable knowledge of single variable calculus is required. For the systems portion, students will study and employ techniques from basic linear algebra.

### Grades

To ensure receipt of a certain letter grade (or better), students must attain a minimum overall percentage. These minima are: A: 90; B: 80; C: 70; D: 60.

### Assignments/Assessments

<i>Date</i>	<i>Event</i>	<i>Percentage</i>
<i>Various</i>	<i>Homework/Labs</i>	<i>40</i>
<i>February 10</i>	<i>Exam 1</i>	<i>20</i>
<i>March 24</i>	<i>Exam 2</i>	<i>20</i>
<i>May 3</i>	<i>Final Exam</i>	<i>20</i>

### Attendance Policy

The University Attendance policy as stated in the 2009-2010 catalog ([http://www.winthrop.edu/uploadedFiles/recandreg/Catalogs/09-10/2009\\_10\\_catalog\\_Acad\\_Regs.pdf](http://www.winthrop.edu/uploadedFiles/recandreg/Catalogs/09-10/2009_10_catalog_Acad_Regs.pdf)): if a student's absences in a course total 25 percent or more of the class meetings for the course, the student will receive a grade of N if the student withdraws from the course before the withdrawal deadline; after that date, unless warranted by documented extenuating circumstances as described in the previous section, a grade of F or U shall be assigned.

## **Text**

Differential Equations With Initial Value Problems, 2<sup>nd</sup> Ed. John Polking, Albert Bogges, & David Arnold  
2006, ISBN: 0-13-186236-7.

## **Homework**

Expect homework assignments to reinforce the lesson material and prepare you for exams. Additionally, homework will be a significant portion of your course grade. I expect you to work each problem assigned, but I may only grade a random sample of those, perhaps in the form of a quiz (this depends on my grading load -- details to follow). As such, you'll need to see me or other students in the class to ensure correctness and understanding of those problems not graded. I do not plan to post homework/quiz solutions. If we use quizzes, we'll discuss and develop a policy for missing these events.

## **Exams**

These may be closed book, no notes, no computer, no cell phone, individual effort events.

## **Missed exam policy**

If you must miss an exam for a legitimate reason, you must provide appropriate documentation at least two weeks prior to the exam to ensure alternate arrangements. If you miss an exam for an unacceptable reason, you will receive a zero as your score.

## **Students with Disabilities**

Winthrop University is dedicated to providing access to education. If you have a disability and need classroom accommodations, please contact Gena Smith, Coordinator, Services for Students with Disabilities (SSWD), at 323-3290, as soon as possible. Once you have your Professor Notification Form, please tell me so that I am aware of your accommodations. If you require special testing consideration for a disability, contact the SSWD and bring me the appropriate paperwork in a timely fashion.

## **Policies**

1. Review the student code of conduct for university policies on academic misconduct. Academic misconduct will not be tolerated and will result in a failing grade on the assignment and/or in the course. The full handbook is available online at: (<http://www2.winthrop.edu/studentaffairs/handbook/StudentHandbook.pdf>)
2. All electronic devices (including cell phones) other than a calculator should be on silent and kept in your book bag or purse throughout class time unless otherwise instructed. (Note if you have some educational, health, or physical reason for an electronic device you must work with your professor to inform them of the accommodation.)

**SU Deadline:** March 9  
**Spring Break:** March 14 - 20

**Course Withdraw Date:** March 9  
**Final Exam:** May 3

**Departmental goals:**

1. Apply fundamental mathematical concepts and techniques to solve problems and evaluate results.
2. Demonstrate the ability to apply appropriate technologies to the study of mathematics and effectively use such technologies to investigate and develop an understanding of mathematical ideas.

**Course Goals:**

1. Analytically solve first order differential equations, initial value and applied problems using integration, separability, and linear techniques.
2. Analytically solve second order differential equations, initial value, and applied problems with linear techniques.
3. Use the method of Laplace transforms to solve 1<sup>st</sup> and 2<sup>nd</sup> order differential equations involving impulses, delays, and variable coefficients.
4. Analytically solve systems of first order differential equations, initial value, and applied problems with linear techniques.

**Course Calendar**

The following is a tentative guideline, as I want to keep the flexibility to modify the pace and add or remove topics and computer labs as appropriate. Exams do not share this flexibility -- this will allow more effective planning by all.

Date	Sections/Event	Subject
January 10	1.1, 2.1	Mathematical modeling
12	Lab	Direction fields
19	1.3, 2.2	Integral & separable solutions
23	2.4	Integrating factor & variation of parameters
25	2.3, 2.5	Applications
31	2.6 - 2.8	Other first order considerations
February 2	4.3	The characteristic equation
7	4.1	Linear independence
9	Exam 1	
14	4.4	Harmonic analysis
16	4.5	2 <sup>nd</sup> order undetermined coefficients
21	4.6	2 <sup>nd</sup> order variation of parameters
23	4.7	More harmonic analysis
28	5.1, 5.2	The Laplace transform
March 2	5.3, 5.4	Inversions
7	5.5	Translations
9	5.6	Impulse response & variable coefficients
21	Lab	Transforms
23	Exam 2	
28	5.7	Convolutions & delays
30	Chapter 7	Basic linear algebra
4	8.1, 8.4	Systems of differential equations
6	9.1	Spectral analysis
11	9.2	Orthogonal bases
13		Systems applications
18	Lab	Systems
20	9.5	Higher-dimensional systems
25	9.9	Variation of parameters
May 3	Final Exam	11:30a - 2p