MATH 2120 Differential Equations  
Fall 2004 Syllabus  
Department of Mathematics  
Tennessee Technological University

- Instructor: Dr. Fu Zhang  
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  - URL of this course: http://math.tntech.edu/fzhang/DifferentialEquations  
  - Office hours: MWF, 10:00 - 10:50 am and by appointment  
- Class meets: MWF 9:05 - 10:00 a.m., Bruner 112  
- Course objectives: This course is designed to provide instruction in techniques used in solving ordinary differential equations commonly encountered in mathematical physics and engineering. Some modeling example will be introduced to demonstrate applications of differential equations.  
- Pre- and Co-requisite: C or better in MATH 1920 (Calc II).  
- Credits: 3 credit  
- Exams: Exam 1 Friday, Oct. 1  
  Exam 2 Friday, Nov. 5  
  Exam 3 Friday, Dec. 3  
  Final Dec. 13 (Mon.), 8:00 a.m.-10:00 a.m.  
- Grading Policy: Homework and Lab 50pts, Exams 300pts(100pts each), Final 150pts (Total Maximum 500pts)  
- A: at least 90%, B: 80% to 89%, C: 70% to 79%, D: 60% to 69%, and F: below 60%  
- Attendance is required.  
- Honesty and Academic Conduct  
The penalty for cheating in this class is an automatic "F" for a final course grade. You are expected to have the proper materials with you in class and not provide a disruptive environment for other students in this course.  
**NO makeup exams or quizzes** will be given. In the event a full exam (or quiz) is missed, the weight of a future exam (or quiz) will be modified to accommodate for the the missed exam (or quiz).
• Topics to be covered:

**Chapter 1 Introduction**, 1.1 Background,
1.2 Solutions and Initial Value Problems,
1.3 Direction Fields

**Chapter 2 First Order Differential Equations**, 
2.2 Separable Equations,
2.3 Linear Equations,
2.4 Exact Equations,
2.6 Substitutions and Transformations,

**Chapter 3 Mathematical Models**, 
3.5 Electrical Circuits

**Chapter 4 Linear Second Order Equations**, 
4.2 Homogeneous Linear Equations; the General Solution,
4.3 Auxiliary Equations with Complex Roots,
4.4 Nonhomogeneous Linear Equations: the Method of Undetermined Coefficients,
4.5 The Superposition Principle and Undetermined Coefficients Revisited,
4.6 Variation of Parameters,
4.7 Qualitative Considerations for Variable-Coefficient and Nonlinear Equations,
4.8 A Closer Look at Free Mechanical Vibrations,
4.9 A Closer Look at Forced Mechanical Vibrations

**Chapter 5 Introduction to Systems and Phase Plane Analysis**, 
5.4 Introduction to the Phase Plane (Optional)

**Chapter 6 Theory of Higher-Order Linear Differential Equations**, 
6.1 Basic Theory of Linear Differential Equations,
6.2 Homogeneous Linear Equations with Constant Coefficients,
6.3 Undetermined Coefficients and the Annihilator Method,
6.4 Method of Variation of Parameters

**Chapter 7 Laplace Transforms**, 
7.2 Definition of the Laplace Transform
7.3 Properties of the Laplace Transform,
7.4 Inverse Laplace Transform,
7.5 Solving Initial Value Problems,
7.6 Transforms of Discontinuous and Periodic Functions,
7.7 Convolution,
7.8 Impulses and the Dirac Delta Function

**Chapter 8 Series Solutions of Linear Equations**, 

8.1 Introduction: The Taylor Polynomial Approximation (Optional, motivational)
8.2 Power Series and Analytic Functions
8.3 Power Series Solutions to Linear Differential Equations (Optional)
8.4 Equations with Analytic Coefficients (Optional)
8.5 Cauchy-Euler (Equidimensional) Equations
8.6 Method of Frobenius
8.7 Finding a Second Linearly Independent Solution (Optional, if time permits)

The above topics may be revised as we go along

• Additional information:
There will be several lab assignments using Maple to solve differential equations. Knowledge on Maple is not necessary. There will be step by step instructions on how to use Maple along with the assignments.

Students with a disability requiring accommodations should contact the Office of Disability Services (ODS). An Accommodation Request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The ODS is located in the Roaden University Center, Room 112; phone 372-6119.