MATH 2120 Differential Equations
Fall 2005 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, 11:10 am - 12:10 pm and by appointment

• Class meets: TR 9:30 - 10:50 am, 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). It is recommended, but not required that, students take MATH 2010 before taking MATH 2120

• Credits: 3 credit

♣ Your course grade will be determined by
○ Quizzes 10%
○ Midterm Exams 60% (20% each)
○ Final Exam 30%

• Homework Homeworks will be assigned on a weekly basis on Tuesdays which will usually be due. Selected homeworks will be collected and will be given feedbacks.
• **Quizzes** The quizzes are open book and open notes. They will be announced during the classes before the classes that quizzes are given.

• **Exams** The exams are close book and close notes. You can use your calculator if you like but they are not necessary in any of the exams. So all you need for the exams of this course are pencils and erasers. The final exam is comprehensive.

♣ **Exam dates:**

Exam 1 Thursday, September 15
Exam 2 Tuesday, October 11
Exam 3 Thursday, November 17
Final Monday, December 12, 10:30 am -12:30 pm

• A: at least 90%, B: 80% to 89%, C: 70% to 79%, D: 60% to 69%, and F: below 60%

♣ **Important dates from University Calendar:**

◊ Friday September 9, 2005, last day to drop a course without a grade.
◊ Friday, November 4, 2005, last day to drop a course with a W grade.

• Attendance is mandatory.

• 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 accomodate for the the missed exam (or quiz).

♣ **Topics to be covered and exercises:**

**Chapter 1 Introduction,**
1.1 Background (1, 3, 4, 5, 13)
1.2 Solutions and Initial Value Problems (1(c), 2(b), 7, 10, 19, 20, 23, 26, 27)
1.3 Direction Fields (1, 2, 7, 8)

**Chapter 2 First Order Differential Equations,**
2.2 Separable Equations (1, 11, 17, 33)
2.3 Linear Equations (1, 3, 7, 17, 21, 23)
2.4 Exact Equations (1, 3, 9, 15, 27, 32)
2.6 Substitutions and Transformations (1-8, 12, 24, 30, 43)

Chapter 3 Mathematical Models,
3.2 Compartmental Analysis (1, 5, 11) 3.3 Heating and Cooling of buildings (1, 2, 8)
3.4 Newtonian Mechanics (1, 5)
3.5 Electrical Circuits (1,4,5,6)

Chapter 4 Linear Second Order Equations,
4.2 Homogeneous Linear Equations; the General Solution (1, 2, 14, 15, 27, 28, 30, 34, 36)
4.3 Auxiliary Equations with Complex Roots (1, 7, 9, 10, 21, 26, 27, 32, 33, 34)
4.4 Nonhomogeneous Linear Equations: the Method of Undetermined Coefficients (1-8, 9, 13, 19, 30, 31)
4.5 The Superposition Principle and Undetermined Coefficients Revisited (1, 4, 8, 9-16, 18, 23, 31)
4.6 Variation of Parameters (1, 2, 6, 11, 13, 21, 25)
4.7 Qualitative Considerations for Variable-Coefficient and Nonlinear Equations (Optional)
4.8 A Closer Look at Free Mechanical Vibrations (1, 2, 3, 4, 13, 16)
4.9 A Closer Look at Forced Mechanical Vibrations (1, 3, 4, 5, 6, 9, 10, 13)

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 (1, 3, 8, 9, 15, 23)
6.2 Homogeneous Linear Equations with Constant Coefficients (1, 3, 4, 6, 13, 15, 16, 19, 31)
6.3 Undetermined Coefficients and the Annihilator Method (6, 12, 17, 19, 21, 31, 37)
6.4 Method of Variation of Parameters (2, 6, 7, 12, 13, 14)

Chapter 7 Laplace Transforms,
7.2 Definition of the Laplace Transform (3, 4, 9, 11, 13, 15, 29)
7.3 Properties of the Laplace Transform (1, 2, 12, 21, 22, 31, 32)
7.4 Inverse Laplace Transform (1, 3, 10, 31, 33)
7.5 Solving Initial Value Problems (1, 11, 15, 33)
7.6 Transforms of Discontinuous and Periodic Functions (2, 3, 5, 8, 11, 15)
The above topics may be revised as we go along.

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.