Course Number: Math 3120
Semester: Spring 2013
Credit Hours: Three (3)
Effective From: Jan. 17 – May 01, 2013

Instructor Information

Instructor: Dr. Wandi Ding
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Office Hours: MWF 10:10 – 11:10am, R 9:00 – 11:00am, or by appointment

Course Information

Class Schedule: MWF 9:10 – 10:05 a.m. in KOM 225
Prerequisites: MATH 1920, preferable MATH 3110.

Text Book: Nagle, Saff and Snider: Fundamentals of Differential Equations and Boundary Value Problems, **6th** Edition.

Objectives:

- Learn to recognize and classify various types of ordinary differential equations.
- Get used to thinking about and working with functions as variables.
- Understand the qualitative nature of solutions to certain classes of differential equations, with emphasis on exponential growth, oscillations and equilibrium solutions.
- Learn to solve certain types of elementary differential equations analytically, with an emphasis on first order differential equations and higher order linear differential equations.
- Develop skills in formulating differential equation models to address problems arising in engineering, physics, biology and other applied areas.
- Gain exposure to a few numerical and graphical tools for studying and solving differential equations.
- To utilize a student's background in Calculus in solving differential equations.
- To illustrate several of the many applications of differential equations.

Course Contents: (subject to change)

Chapter 1: Introduction
- Section 1.2: Solutions and Initial Value Problems.
- Section 1.3: Direction Fields.

- Section 1.4: The Approximation Method of Euler.

Chapter 2: First–Order Differential Equations

- Section 2.2: Separable Equations.
- Section 2.3: Linear Equations.
- Section 2.4: Exact Equations.

Chapter 3: Mathematical Models and Numerical Methods Involving First-Order Equations

- Section 3.2:Compartmental Analysis.
- Section 3.4: Newtonian Mechanics.
- Section 3.6: Improved Euler's Method.
- Section 3.7: Higher-Order Numerical Methods: Taylor and Runge-Kutta

Chapter 4: Linear Second-Order Equations

- Section 4.1: Introduction: The Mass-Spring Oscillator.
- Section 4.2: Homogeneous Linear Equations: The General Solution.
- Section 4.3: Auxiliary Equations with Complex Roots.
- Section 4.4: Nonhomogeneous Equations: The Method of Undetermined Coefficients.
- Section 4.5: The Superposition Principle and Undetermined Coefficients Revisited.
- Section 4.6: Variation of Parameters.
- Section 4.7: Variable-Coefficient Equations

Chapter 5: Introduction to Systems and Phase Plane Analysis

- Section 5.2: Differential Operators and the Elimination Method for Systems.
- Section 5.4: Introduction to the Phase Plane.
- Section 5.5: Application to Biomathematics: Epidemic and Tumor Growth Models.

Chapter 7: Laplace Transforms

- Section 7.2: Definition of the Laplace Transform.
- Section 7.3: Properties of Laplace Transform.
- Section 7.4: Inverse Laplace Transform.
- Section 7.5: Solving Initial Value Problems.
- Section 7.6: Transforms of Discontinuous and Periodic Functions.
- Section 7.7: Convolution.
- Section 7.8: Impulses and the Dirac Delta Function.
- Section 7.9: Solving Linear Systems with Laplace Transforms.

Maple

There will be introductory classes for Maple. The students will be asked to program in Maple and compare the results with their theoretical studies.

Requirements: In general, you are expected to

1. Attend all the class lectures;

2. Come to class prepared (this includes completing homework in a timely manner and bringing your textbook). **No late homework will be accepted unless there are situations involving extreme extenuating circumstances beyond the student's control.**

3. Read the textbook and the lecture notes thoroughly and solve the assigned problems;

4. Ask question in class when you are unsure of any concept or unclear on any assigned problem;

5. Come to my office for additional assistance as necessary;

6. Take all exams on the day they are scheduled. **If you miss one of the three in class exams, you will have one week to schedule a make-up.** Please understand the make-up exams will be different. If one week passes and no make-up exam has been rescheduled then a zero is recorded for that exam.

Grading Policy:

- Homework/project: 20%
- Exam 1: 20%
- Exam 2: 20%
- Exam 3: 20%
- Final Exam: 20%

- 90 – 100 A, 80 - 89 B, 70 - 79 C, 60 - 69 D, Below 60 F.

Final Exam: Wednesday, May 08. 10:00 a.m. -12:00 p.m.

Additional Information

Drop/Withdrawal Policy and Dates
Please note the Drop Policy and Withdrawal Procedures as they are stated in the Spring 2013 Registration Guide. The last day to drop this course without a grade is January 30. The last day to drop this course with a "W" is March 29. Last day of classes is May 01. A grade of "I" will be given only in accordance with University Policy.

A grade of "I" will be given only in accordance with University Policy. No grade of "W" will be assigned after the official drop date except in situations involving extreme extenuating circumstances beyond the student's control. In particular, a "W" will not be granted merely because the student is failing. Students should be aware that missing the official drop date and thereby receiving an "F" can have ramifications on financial aid.

Lottery Scholarships
Do you have a lottery scholarship? **A grade of C, D, F, W, or I in this class may negatively impact TELS eligibility.** To retain Tennessee Education Lottery Scholarship eligibility, you must earn a cumulative TELS GPA of 2.75 after 24 and 48 attempted hours and a cumulative TELS GPA of 3.0 thereafter. You may qualify with a 2.75 cumulative GPA after 72 attempted hours (and subsequent semesters), if you are enrolled full-time and maintain a semester GPA of at least 3.0. Dropping a class after 14 days may also impact eligibility; if you withdraw from this class and it results in an enrollment status of less than full time, you may lose eligibility for your lottery scholarship. Lottery recipients are eligible to receive the scholarship for a

maximum of five years from the date of initial enrollment, or until a bachelor degree is earned; students who first received the lottery scholarship in Fall 2009 or later will additionally be limited to 120 TELS attempted hours. For additional Lottery rules, please refer to your Lottery Statement of Understanding form via RaiderNet, review lottery requirements on the web atwww.mtsu.edu/scholarships/telsconteligibility_scholarships.php, or contact Lisa Throneberry atlisa.throneberry@mtsu.edu.

Disability Assistance

If you have a disability that may require assistance or accommodation, or you have questions related to any accommodations for testing, note takers, readers, etc., speak with me as soon as possible. Students must also contact the Office of Disabled Students Services (898-2783) with questions about scheduling such services.