

Course Description : First order equations: modeling and population dynamics, stability, existence and uniqueness theorem for nonlinear equations, Euler's method. Second order equations: nonlinear equations via reductions methods, variation of parameters, forced mechanical vibrations, resonance and beat. Laplace Transform: general forcing functions, the convolution integral. Systems of ODEs: eigenvalues and phase plane analysis.

Prerequisites : Grade of C or better in MATH 2414 or its equivalent

Prepares for : MATH 4302, 4315

Text : No required text. Notes available online.

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<http://www.math.lamar.edu>

<http://tutorial.math.lamar.edu>

Office Hours : 12:30 – 2:30 Monday thru Thursday or by appointment.

Grading : Grades will come from the following sources in this class.

Written Homework : Homework will typically be due 1- 1½ weeks after I hand the set out. Each homework assignment will be typically worth a total of 10 points and only selected problems from each assignment will be graded. Homework is due at the start of class (*i.e.* the moment that I walk into the classroom and start talking) on the day that it is due. Any homework handed in after this point is late and will not be accepted. I will drop your lowest homework score at the end of the semester.

Hour Exams : There will be four hour exams each worth 100 points. The material covered on each exam and tentative date for the exam is listed on the Syllabus for my notes. Because I'm fixing the material on each exam at this point scheduling will be very tentative at best. It is your responsibility to get to class and find out the actual date of the exam!

Comprehensive Final Exam : There will also be a comprehensive final exam worth 200 points. The final will be on Monday, May 7 from 8:00 AM --- 10:30 AM (provided I read the exam schedule right). At the end of the semester if you have gotten at least 90% of the total possible points (*i.e.* you have an A in the course) you will be exempt from taking the final. For ALL OTHERS the final exam is MANDATORY. The 90% is a hard cutoff point and will not be changed for any reason. Even an 89.9% will be required to take the final exam.

Lowest Test Score Replacement : After final exams are given I will replace your lowest test score with the percentage on your final exam provided it will help your grade. For example if your lowest grade is a 72 and you have a final exam score of 164 then I will replace the 72 with $164/200 (x 100) = 82$. If on the other hand your final exam score is 128 I will not replace the 72 with your final exam percent ($128/200 (x 100) = 64$) since it is lower than the 72.

Attendance : Attendance will be taken every day and will be used in any way I see fit in setting final grades.

Grading & Scale : I have a very simple grading scale. At the end of the semester I add up all the points that you have received and then divide that number by the total possible number of points. I then compare this percentage to the following scale and assign your grade.

100% - 90% A, 89% - 80% B, 79% - 70% C, 69% - 60% D, 59% - 0% F

Calculators : No graphing calculators will be allowed during exams. If I see you using one on an exam you will lose your calculator for the rest of the exam and you will lose 20 points on your exam score. Failure to bring an appropriate calculator to exams is your problem not mine.

Makeup Exams : I do not give makeup exams. Because I replace your lowest test score with the final exam percentage if you miss **ONE** exam then that will be the exam that is replaced by the final exam percentage provided you notify me in writing no later than 3 days after the exam was given with the reason you missed the exam. If you miss two exams I will expect verifiable proof of very good reasons (my call on what is very good) for BOTH exams. If you provide such proof we will take care of the second missed exam at that point. To date no one has convinced me they had a good reason for missing two exams.

Lectures Session : This class meets three days a week. We will be lecturing each day.

Web Pages : The web page for this class can be accessed at <http://www.math.lamar.edu>. Click on the faculty link, my name, then the class link from the menu as the top of the page. On this page you will find things like exam dates, homework assignments, homework solutions and other handouts. Information put on this site is NOT official. If there is ever any discrepancy between the web site and anything announced in class, then follow what was announced in class! Notes for the class may be downloaded from <http://tutorial.math.lamar.edu>. Please note that the assignment problems on <http://tutoria.math.lamar.edu> are **NOT** your homework assignments. Those are for other purposes. **Your homework assignments/solutions are at <http://www.math.lamar.edu>.**

Learning Outcomes : Upon completion of the course, students will:

1. Identify homogeneous equations, homogeneous equations with constant coefficients, and exact and linear differential equations.
2. Solve ordinary differential equations and systems of equations using:
 - a) Direct integration
 - b) Separation of variables
 - c) Reduction of order
 - d) Methods of undetermined coefficients and variation of parameters
 - e) Series solutions
 - f) Operator methods for finding particular solutions
 - g) Laplace transform methods
3. Determine particular solutions to differential equations with given boundary conditions or initial conditions.
4. Analyze real-world problems in fields such as Biology, Chemistry, Economics, Engineering, and Physics, including problems related to population dynamics, mixtures, growth and decay, heating and cooling, electronic circuits, and Newtonian mechanics.
5. Sketch a direction field of first order differential equations and interpret solution behavior from the direction field;
6. Identify and classify equilibrium points/solutions for a differential equation;
7. Use numerical methods to approximate the solution to a differential equation;
8. Work basic modeling problems such as Population Dynamics, Falling Body, and Mixing Problems;
9. Find the Fundamental Set of Solutions for a differential equation;
10. Find and apply the Wronskian to a second order differential equation;
11. Apply the techniques used to solve second order differential equations to higher order differential equations;
12. Work with the Heaviside function in the transform and inverse transform process;
13. Work with the Dirac-Delta function in the transform and inverse transform process;
14. Work with convolution integrals in the transform and inverse transform process;
15. Sketch the phase portrait for a system of differential equations;
16. Solve a system of differential equations using eigenvalues and eigenvectors.

Dates To Know :

March 12 – 16 : Spring Break. No classes.

March 30 : Good Friday. No classes.

April 30 : Last day of classes.

Drop Dates : See Important Student Information handout for drop dates.

Disclaimer : While I have made a sincere effort to ensure that this syllabus is correct, changes may be required. I will announce any substantive changes during a regularly scheduled class. If you find an error or omission, please advise me at once so that the other members of the class may be advised.