MATH 3410.005: Differential Equations I

TIME AND PLACE: Wh 117, TIME: MoWeFr 12:00 - 12:50pm
PROFESSOR: Santiago I. Betelú
OFFICE: GAB 470B, e-mail: santiago.betelu@unt.edu
TEXT: W. E. Boyce and R. C. DiPrima: "Elementary Differential Equations and Boundary Value Problems", John Wiley and Sons 12th ed
OFFICE HOURS: GAB 470B MoWeFr 8-8:50am and 9:55-11:55am

COURSE DESCRIPTION: First-order equations, existence-uniqueness theorem, linear equations, separation of variables, higher-order linear equations, systems of linear equations, series solutions and numerical solutions.
OBJECTIVES: You will learn to classify and solve the ordinary differential equations described in the table below, understand and use existence-uniqueness theorems, find the domain of existence of the solutions, and apply differential equations to solve real-world problems.
GRADES: Grades will be based on three midterm exams (20 points each), homeworks and quizes (20 points) and a final exam (40 points). The lowest of the midterm grades is dropped, so the maximum score is 100. To earn an A you need 90 points, 80 for a B, 70 for a C and 60 for a D.
HOMEWORK: Will be assigned in Canvas and your solutions must be uploaded within the indicated deadline. The homework must be clear and show all intermediate steps. Check with the solutions at the end of the chapter, if you don't get them, come to office hours for help. Late homework is worth zero points.
EXAMS: Midterm exams will be given in class during normal class time and same classroom, on Sep 22, Oct 27 and Dec 1. The final exam is scheduled on Wed December 13 at 10:30am-12:30.
DISABILITIES: It is responsibility of students with certified disabilities to provide the instructor with appropriate documentation from UNT ODA office. If you qualify for extra time you must take the exam at the ODA Test Center.

CHEATING: will not be tolerated. Anyone caught cheating will receive an F for the course. Notes, calculators or electronic devices are not allowed during exams.

SCHEDULE:

Week	Sections	Summary
Aug 21	1.1 - 1.2 -1.3 - 2.1 - 2.2	Definition and classification of DE's. Direction fields. Linear 1st order ODEs. Separable ODEs. Homogeneous ODEs.
Aug 28	2.3 - 2.4 - 2.5	Modeling with DE's. Linear versus nonlinear equations. Domain of existence. Bernoulli ODEs. Autonomous equations. Population dynamics. Hanging chains, rockets, thermal problems and other applications.
Sep 4	2.6 - 2.7 - 2.8	Exact equations. Integrating factors. Euler's approximation. Existence and uniqueness of solutions. Change of variables.
Sep 11	3.1 - 3.2	2nd order linear equations. Existence and uniqueness. Equations with constant coefficients. Characteristic equation. Linear independence.
Sep 18	3.3- 3.4 -3.5	Complex roots of the characteristic equation. Euler equations. Reduction of order. More changes of variable.
Sep 25	3.5 - 3.6 - 3.7	Nonhomogeneous equations. Undetermined coefficients. Variation of parameters.
Oct 2	3.8 - 3.9 - 4.1	Mechanical oscillations. Forced vibrations and resonance. Higher order linear equations. Existence of solutions.
Oct 9	4.2 - 4.3 - 4.4	Higher order linear equations. Basic theory. Constant coefficients. Complex roots of characteristic equation. Repeated roots. Undetermined coefficients. Applications to oscillating systems.
Oct 16	5.1 - 5.2 - 5.3	Power series. Solutions using power series near ordinary points. Recurrence formulas and radius of convergence. Basic theorems.
Oct 23	5.3 - 5.4 - 5.5	Regular singular points. Relationship to Euler equations. Indicial equation, recurrences and radius of convergence.
Oct 30	6.1 - 6.5	Laplace's Transform. Initial value problems. Step and impulse functions.
Nov 6	6.6 - 7.1- 7.2 -7.3	Convolution. Review of matrices. Direction field.
Nov 13	7.3 - 7.4	Applications to systems of equations: connected tanks, systems of springs and masses. Basic theory of linear systems.
Nov 20	7.5 - 7.6	Systems with constant coefficients. Complex eigenvalues. Oscillating physical applications.
Nov 27	7.8 - 7.9	Repeated eigenvalues. Nonhomogeneous systems. Comprehensive review
Wed Dec 13		Final Exam 10:30am-12:30am