MATH 3410.003/005: Differential Equations I

PROFESSOR: Santiago I. Betelú
TIME AND PLACE: Asynchronous using Canvas/Zoom
OFFICE HOURS: are not for classes nor material delivery.
MoWeFr 08:00-09:00am https://unt.zoom.us/j/98812375796
MoWeFr 18:00-19:00pm https://unt.zoom.us/j/92870808880 or appointment.
TEXT: W. E. Boyce and R. C. DiPrima: "Elementary Differential Equations and Boundary Value Problems", John Wiley and Sons 11th ed
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.
GRADING: Grades will be based on three midterm exams (15 points each), homework (10 points), quizes (10 points) and a final exam (35 points). 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, connect to Zoom during office hours for help. Late homework is worth zero points.
QUIZZES: Quizzes must be completed at the indicated deadline.
EXAMS: All exams are done with Canvas with Lock Down Browser and Respondus, you can choose any time of the day, but there is a time limit of 1 hour for the midterms and 1 hour 30 minutes for the comprehensive final. Midterm exams will be given on Sep 18, Oct 23 and Nov 20. The final exam is scheduled on Monday December 7. Calculators, electronic devices or notes are not allowed during exams.
DISABILITIES: It is responsibility of students with certified disabilities to provide the instructor with appropriate documentation from UNT ODA office.
CHEATING: will not be tolerated. Anyone caught cheating will receive an F for the course. Turn off phones during exams. You are not allowed to browse the internet or communicate with anybody during exams.

Week	Sections	Summary
Aug 24	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 31	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 7	2.6 - 2.7 - 2.8	Exact equations. Integrating factors. Euler's approximation. Existence and uniqueness of solutions. Change of variables.
Sep 14	3.1 - 3.2	2nd order linear equations. Existence and uniqueness. Equations with constant coefficients. Characteristic equation. Linear independence.
Sep 21	3.3- 3.4 -3.5	Complex roots of the characteristic equation. Euler equations. Reduction of order. More changes of variable.
Sep 28	3.5 - 3.6 - 3.7	Nonhomogeneous equations. Undetermined coefficients. Variation of parameters.
Oct 5	3.8 - 3.9 - 4.1	Mechanical oscillations. Forced vibrations and resonance. Higher order linear equations. Existence of solutions.
Oct 12	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 19	5.1 - 5.2 - 5.3	Power series. Solutions using power series near ordinary points. Recurrence formulas and radius of convergence. Basic theorems.
Oct 26	5.3 - 5.4 - 5.5	Regular singular points. Relationship to Euler equations. Indicial equation, recurrences and radius of convergence.
Nov 2	6.1 - 6.5	Laplace's Transform. Initial value problems. Step and impulse functions.
Nov 9	6.6 - 7.1- 7.2 -7.3	Convolution. Review of matrices. Direction field.
Nov 16	7.3 - 7.4	Applications to systems of equations: connected tanks, systems of springs and masses. Basic theory of linear systems.
Nov 23	7.5 - 7.6	Systems with constant coefficients. Complex eigenvalues. Oscillating physical applications.
Nov 30	7.8 - 7.9	Repeated eigenvalues. Nonhomogeneous systems. Comprehensive review
Mon Dec 7		Final Exam