

# MATH 3410-002: Differential Equations I (tentative)

TIME AND PLACE: MWF 08:00 - 8:50AM - BLB 035

PROFESSOR: Santiago I. Betelú

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TEXT: W. E. Boyce and R. C. DiPrima: "Elementary Differential Equations and Boundary Value Problems", John Wiley and Sons 10th ed

OFFICE HOURS: MWF 10:00-12:00

**Grading:** Grades will be based on three midterm exams (20 points each), homework and special projects (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:** They will be assigned each class, to be completed the same day of the following week. 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 my office for help.

**Exams:** Midterm exams will be given in class on Sep 22, Oct 27 and Nov 24 on the usual class time. The final exam is scheduled on Mon Dec 11, 8:00:10AM on the same classroom (these dates may change).

**Disabilities:** It is responsibility of students with certified disabilities to provide the instructor with appropriate documentation from the Dean of Students Office.

**Cheating:** No cheating will be tolerated. Anyone caught cheating will receive an F for the course. Turn off phones during class and exams.

Week	Sections	Summary
Aug 28	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.
Sep 6	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 11	2.6 - 2.7 - 2.8	Exact equations. Integrating factors. Euler's approximation. Existence and uniqueness of solutions. Change of variables.
Sep 18	3.1 - 3.2	2nd order linear equations. Existence and uniqueness. Equations with constant coefficients. Characteristic equation. Linear independence. Review - Midterm 1
Sep 25	3.3- 3.4 - 3.5	Complex roots of the characteristic equation. Euler equations. Reduction of order. More changes of variable.
Oct 2	3.5 - 3.6 - 3.7	Nonhomogeneous equations. Undetermined coefficients. Variation of parameters.
Oct 9	3.8 - 3.9 - 4.1	Mechanical oscillations. Forced vibrations and resonance. Higher order linear equations. Existence of solutions.
Oct 16	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 23	5.1 - 5.2 - 5.3	Power series. Solutions using power series near ordinary points. Recurrence formulas and radius of convergence. Basic theorems. Review- Midterm 2
Oct 30	5.3 - 5.4 - 5.5	Regular singular points. Relation to Euler equations. Indicial equation, recurrences and radius of convergence.
Nov 6	5.6 - 5.7 - 7.1	Bessel equation and Legendre equations and applications. Systems of linear equations.
Nov 13	7.2 - 7.3 - 7.4	Review of matrices. Basic theory of linear systems of equations. Solving problems with eigenvalues and eigenvectors. Direction field.
Nov 20	7.4 - 7.5	Applications to systems of equations: connected tanks, systems of springs and masses. Review - Midterm 3
Nov 27	7.6 - 7.8 - 7.9	Complex eigenvalues and repeated eigenvalues. Nonhomogeneous systems.
Dec 4	8.1 - 8.2 - 8.3 - 9.1	Basic numerical approximations. Explicit and implicit Euler. Runge Kutta. Analyzing autonomous systems of equations using the phase plane. Application: predator-prey models.
Dec 11		Final Exam Mon 8:00-10:00AM