MATH 3420.001: Differential Equations II (TENTATIVE)

PROFESSOR: Santiago I. Betelú
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TIME AND PLACE: TueThu 12:30-13:50PM at BLB 035

OFFICE HOURS: TueThu 11:25-12:25PM and MoWeFr 10:00-11:00AM at GAB 470B

TEXT: "Applied Partial Differential Equation", by Richard Haberman, fifth edition.

GRADES: Grades will be based on three midterm exams (20 points each), homework (20 points) and a final exam (40 points). The lowest of the midterms is dropped, thus you can earn up to 100 points in total. 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 each class and due within 5 days. 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 the correct answer come to my office for help.

EXAMS: Midterm exams will be given in class during normal class time and same classroom February 12, March 19 and April 23. The final exam is scheduled on Thu May 7 10:00AM-12:00.

DISSABILITIES: Students with certified disabilities must provide the instructor with appropriate documentation from the ODA Office, and take the exams at the ODA testing center.

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

SCHEDULE

Week	Summary
Jan 12	Introduction to PDEs. Separation of variables. General vs. particular solutions. The Heat Equation. Dimensionless problems.
Jan 20	Boundary and initial conditions. Equilibrium temperature distribution. Linearity and superposition.
Jan 26	Boundary value problems: eigenvalues and eigenfunctions.
Feb 2	Fourier series. Orthogonality of functions. Eigenfunction expansions. Initial value problem for the Heat Equation.
Feb 9	Non homogeneous problems. Critical mass problems. Classification of PDE's: parabolic, elliptic and hyperbolic problems.
Feb 17	Laplace's Equation. Boundary conditions. Well versus ill posed problems. Applications.
Feb 23	The Wave Equation. Vibrating strings. Solutions of the initial value problem. D'Alembert solutions.
Mar 2	Sturm Liouville theorem. Generalized Fourier series. Applications.
Mar 9	Mixed boundary conditions. Further applications to physics, engineering, finance and hydrodynamics.
Mar 16	Heat, Wave and Laplace equations in polar and in spherical coordinates. Bessel functions and Legendre polynomials. Vibrating membranes.
Mar 23	Cylindrical, azimuthal and spherical symmetries. Asymptotic boundary conditions. Applications: cavities, waveguides, irrotational flows past cylinders and spheres.
Mar 30	Fourier Transform. Heat equation in an infinite domain. Delta of Dirac.
Apr 6	Method of Characteristics. Nonlinear conservation laws. Discontinuous solutions, shock waves.
Apr 13	Similarity solutions of nonlinear problems. Applications to geophysics.
Apr 20	Laplace Transform, Duhamel principle. Evolution of seasonal underground temperature.
Apr 27	Numerical solutions. Comprehensive review for the final.
May 7	Final Exam 10:00AM-12:00