Math 2250 Syllabus

Linear Algebra and Differential Equations

This course treats topics in linear algebra and differential equations, using matrix and linear algebra to understand linear differential equations and systems of linear differential equations.

Text: Differential Equations and Linear Algebra, 3rd Edition, by Edwards and Penney , chapters 1-7, 9-10.

Course outline:

Week 1	1.1-1.3	Differential equations and modeling, anti-differentiation, slope fields
Week 2	1.4-1.5; EP3.7	Separable and linear differential equations; Initial value problems and slope fields; Electrical circuits.
Week 3	2.1-2.3	Applications to populations, velocity models; equilibria and stability for autonomous differential equations
Week 4	2.4-2.6, 3.1-3.3	Numerical methods; matrices, linear systems, reduced row echelon form.
Week 5	3.3-3.5	Matrix operations, algebra, and inverses
Week 6	3.6, 4.1	Determinants, review, introduction to linear combinations
Week 7	4.1-4.4	Linear combinations, independence, bases, dimension for vector spaces
Week 8	5.1-5.3	Linear differential equations of 2^{nd} order and higher order
Week 9	5.3-5.5	Constant coefficient linear differential equations: homogeneous and non-homogeneous problems; mechanical applications
Week 10	5.5-5.6, EP3.7 10.1-10.2	Non-homogeneous differential equations; mechanical and circuit applications; introduction to Laplace transform.
Week 11	10.3-10.5	Laplace transform and inverse transform, applications to differential equations; unit step functions; review
Week 12	EP7.6, 10.5, 6.1-6.2, 7.1	Impulse functions; eigenvalues and eigenvectors for matrices; introduction to systems of differential equations
Week 13	7.2-7.4	First order systems and input-output models; second order spring systems of differential equations
Week 14	7.4; 9.1-9.3	Nonlinear systems of differential equations; linearization and stability at equilibria; phase plane analysis
Week 15	9.3-9.4	Nonlinear population and mechanical systems phase plane analysis; course review.

Course format: There are four 50-minute lecture presentations per week (or equivalent), and one 50-minute section meeting. Section meetings focus on weekly homework and concepts. Additional software-based project work is drawn from the suggestions in the text. Students are evaluated on the basis of regular homework and/or quizzes based on that homework; project work; 2-3 midterm exams administered during their section meetings; and an in-class final exam administered during the University scheduled time.

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