

## Methods of Mathematical Physics

## Fall Quarter Outline

Week	Seminar/Student Presentations	Mechanics	Differential Equations	Multivariable Calculus
1	Lecture: Taylor 1.1-1.4 Newton's Laws	Taylor 1.1-1.7 Newton's Laws	B&D 1.1 Intro. to Differential Eqns.	Boas 3.4 Vectors and Dot Product
		Taylor 2.1-2.2 Air Resistance	B&D 1.2 Separation of Variables	Boas 3.5 Cross Product, Lines and planes
2	Seminar: Gleick pp. 1-78	Taylor 2.2-2.4 Projectile Motion with drag	B&D 1.3-1.4 Slope Fields/Euler's Method	Boas 1.12-1.13 Review of Taylor Series
		Taylor 2.5-2.7 Motion in a Magnetic Field	B&D 1.5-1.6 Existence and Uniqueness	Hand out: Space Curves
3	Seminar: Gleick pp. 79-140	Taylor Ch 3.1-3.4 Momentum	B&D 1.7 Bifurcations <b>Test on 1.1-1.6</b>	Boas 4.1, 4.3. 4.5 Partial Derivatives and the Chain Rule
		<b>Test on Chapters 1 and 2</b>	B&D 1.8-Linear Differential Eqns.	Boas 6.5,6.6 Directional Derivatives and the Gradient
4	Seminar: Gleick pp. 141-191 + handout  B&D Lab 1.1 Memorization	Taylor 4.1-4.3 Work and Energy	B&D 1.9 and App A. Change of Variables	Boas 6.8 Line integrals
		Taylor 4.4-4.5 Conservative Forces	B&D App B. Series Solutions	Boas 4.8-4.9 Max and Min
5	B&D Lab 1.3 Logistic with Harvesting B&D Lab 1.5 Extinction of Pigeon	Taylor 4.6-4.7 Curvilinear Systems	B&D 2.1-2.2 First Order Systems	<b>Multivariable Test</b>
		Taylor 4.8-4.9 Central Force	B&D 2.3-2.4 Analytic and Numerical Methods	Boas 3.1-3.2 Linear Equations
6	B&D Lab 2.2 Species Dynamics B&D Lab 2.3 Modified Damping	Taylor 5.1-5.3 Simple Harmonic Motion	TBA	Boas 3.6 Matrix Operations
		Taylor 5.4-5.6 Driven Oscillations and Resonance	<b>Test on Chapter 1 and 2</b>	Boas 3.7-3.8 Linear Transformations
7	B&D Lab 2.4 Spring and Band B&D Lab 2.5 Shock Absorbers	Taylor 6.1-6.4 Calculus of Variations	B&D 3.1-3.2 Linear Systems	Boas 3.11 Eigen Vectors and Values
		<b>Test on Chapters 3 to 5</b>	B&D 3.3 Phase Planes	Boas 3.12 Diagonalization
8	B&D Lab 4.1 Two magnets B&D Lab 3.2 RLC Circuits	Taylor 7.1-7.3 Lagrange's Equations	B&D 3.4 Complex Eigenvalues	Boas 3.10 Linear Vector Spaces
		Taylor 7.4-7.7 Examples	B&D 3.5-3.7 2 <sup>nd</sup> Order Linear Diff. Eqns	Boas 3.14 General Vector Spaces
9	B&D Lab 3.4 Parameter Space	Taylor 8.1-8.3 Central Force	B&D 5.1 Intro to Nonlinear Systems	<b>Linear Algebra Test</b>
		Taylor 8.4-8.6 Kepler Orbits	TBA	TBA
10	B&D Lab 4.3 Tacoma Narrows B&D Lab 5.2 Higher Order Pendulum	TBA	TBA	TBA
		<b>Cumulative Final Exam</b>	<b>Cumulative Final Exam</b>	<b>Cumulative Final Exam</b>