MATH 316 – Approximate Daily Syllabus (updated as we go) – FALL 2016

Lecture 1 (Aug 22): Intro: Classification of Differential Equations. Solutions.§1.3
Lecture 2 (Aug 24): Intro: Mathematical Models. Dimensions and units. §1.1
Lecture 3 (Aug 26): 1st order: Direction fields. §1.1
Lecture 4 (Aug 29): 1st order: Autonomous equations. Phase line. §2.5, pp 78-82
Lecture 5 (Aug 31): 1st order: Separable equations. §2.2, §2.5, pp 83-89.
Lecture 6 (Sep 2): 1st order: Linear equations: integrating factor. §2.1.

LABOR DAY

Lecture 7 (Sep 7): 1st order: More Modeling §2.3. Theory: Linear vs nonlinear. 2.4
Lecture 8 (Sep 9): Numerical Method: Euler's Method. Theory: existence and uniqueness. §2.7, 2.8
Lecture 9 (Sep 12): Numerical Methods: Improvements on the Euler Method. §8.2
Lecture 10 (Sep 14): Review.
Lecture 11 (Sep 16): Exam 1
Lecture 12 (Sep 19): 2nd order linear, constant coefficient, homogeneous DE. Case 1: real distinct roots. §3.1
Lecture 13 (Sep 21): The Wronskian. Fundamental sets of solutions. §3.2
Lecture 14 (Sep 23): 2nd order linear, constant coefficient, homogeneous DE. Case 2: complex roots. §3.3
Lecture 15 (Sep 26): 2nd order linear, constant coefficient, homogeneous DE. Case 3: repeated roots. §3.4.
Lecture 16 (Sep 28): 2nd order linear, homogeneous: Method of reduction of order. §3.4
Lecture 17 (Sep 30): Unforced springs. §3.7.
Lecture 18 (Oct 3): 2nd order linear, nonhomogeneous: Method of undetermined coefficients. §3.5
Lecture 19 (Oct 5): Method of undetermined coefficients. Resonance. §3.5
Lecture 20 (Oct 7): Unforced Springs, damped. Forced springs and resonance. §3.7, 3.8
Lecture 21 (Oct 10): Forced springs, undamped. Periodic forcing, resonance, beats. §3.8
Lecture 22 (Oct 12): 2nd order linear, nonhomogeneous: Variation of parameters. §3.6

FALL BREAK

Lecture 23 (Oct 17): Review.
Lecture 24 (Oct 19): Exam 2
Lecture 25 (Oct 21): Laplace Transform: Definition. Linearity. Solving an initial value problem. §6.1 Laplace Transform: Building and using table of transforms. §6.2
Lecture 26 (Oct 24): Laplace Transform: The Shift formula. Functions defined piecewise. §6.3
Lecture 27 (Oct 26): Laplace Transform: Discontinuous forcing. §6.4
Lecture 28 (Oct 28): Laplace Transform: Impulse functions. §6.5
Lecture 29 (Oct 31): Laplace Transform: Convolutions. §6.6
Lecture 30 (Nov 2): Linear systems of equations, Matrices and Vectors. §7.1, 7.2
Lecture 31 (Nov 4): Solving $\mathbf{x}' = A\mathbf{x}$. The eigenvalue problem. §7.3
Lecture 32 (Nov 7): The phase plane. Example. §7.5
Lecture 33 (Nov 9): Solving $\mathbf{x}' = A\mathbf{x}$: real distinct eigenvalues. Equilibria, det(A), eigenvalues. §7.5
Lecture 34 (Nov 11): Solving $\mathbf{x}' = A\mathbf{x}$: real distinct eigenvalues - saddles, nodes, line of equilibria. §7.5
Lecture 35 (Nov 14): Solving $\mathbf{x}' = A\mathbf{x}$: complex eigenvalues - spirals and centers. §7.6
Lecture 36 (Nov 16): Solving $\mathbf{x}' = A\mathbf{x}$: repeated eigenvalues - star nodes, degenerate nodes. §7.8
Lecture 37 (Nov 18): Review
Lecture 38 (Nov 21): Exam 3
Lecture 39 (Nov 23): Intro to nonlinear systems. §9.1

THANKSGIVING BREAK

Lecture 40 (Nov 28): Nonlinear systems: Nullclines. Linearization and stability.
Lecture 41 (Nov 30): Nonlinear systems: Examples. Competing species. Predator Prey model (HW). §9.5
Lecture 42 (Dec 2): Nonlinear systems: The Pendulum. §9.3

Lectures 43-45 (Dec 5-Dec 9) CATCH UP and REVIEW

CUMULATIVE FINAL EXAM: In classroom, December 14th, 3:00pm-5:00pm