

Math 142 - 1: Schedule, January - March 2017

Hours	Technique/Topic	Example Models & Applications
1	Formulating Models	heat loads; turtle migration; ice ages
1	Linear Models	maximizing profit; springs
1	Recurrence Equations	supply and demand; spreading of a rumor; social media
1	Discrete to Continuum Limits	population growth; hash tables
1	Exponential Models	radioactive decay; superconductors
1	Dimensional Analysis and Fermi Estimates	estimating ocean mass, the time to fall through the earth, profit margins, air resistance, and atomic blast energies
1	Nondimensionalization	mass-spring systems; red blood cells
1	Taylor Series	relativistic consistency with Newtonian physics; simple pendulum; stock return fluctuations
2	Scalar ODE Models	Solow economic growth model; passive neuron action potential; Newton's Law of Cooling
2	ODE Systems	predator-prey relations; epidemiology; chemical kinetics; nonlinear pendulum
1	Numerical Methods for ODEs	electrodialysis; human immune response; nonlinear pendulum with quadratic damping; nonlinear population dynamics
2	Formal Asymptotic Series	logistic growth with perturbed capacity; nonlinear pendulum period; hemodialysis
3	Vector Calculus & Conservation	Euler and Navier-Stokes equations for fluids
3	Method of Characteristics	advective transport; age structure of population; traffic flow; gravity-driven flow of viscous fluids
1	Riemann Invariants for Linear(ized) Hyperbolic Systems	sound and linear acoustics; water waves; simple mixtures
2	Probability and Statistics	investment portfolio management; empirical fits of experimental data; bacterial growth
2	Heat/Wave/Laplace Equations	random walks on stock returns; movement of a string; wind chill
	Midterm	February 13
	Final Exam	March 21, 15:00-18:00