

Math 142 - 1: Schedule, September - December 2016

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; building response to earthquake; LRC circuits; Newton's Law of Cooling
2	ODE Systems	predator-prey relations; human immune response; chemical kinetics; nonlinear pendulum
1	Numerical Methods for ODEs	electrodialysis; population growth with gestation period; nonlinear pendulum with quadratic damping
1	Formal Asymptotic Series	logistic growth with perturbed capacity; nonlinear pendulum period; hemodialysis
2	Vector Calculus & Conservation	Euler and Navier-Stokes equations for fluids
2	Method of Characteristics	advective transport; traffic flow; gravity-driven flow of viscous fluids
1	Riemann Invariants for Linear(ized) Hyperbolic Systems	sound and linear acoustics; water waves
2	Probability and Statistics	investment portfolio management; empirical fits of experimental data; comparing two populations
1	Heat/Wave/Laplace Equations	movement of a string; wind chill
	Midterm	October 28
	Final Exam	December 8, 8:00-11:00