Syllabus for Math 168

Grading: Typically, undergraduate mathematics courses have two midterm examinations worth 30% each and a final examination worth 40%. Discussion sections will review and elaborate on materials to be covered in these examinations. On occasion, instructors may also include some combination of quizzes in discussion sections and take-home assignments with corresponding adjustments to the relative weights of the examinations.

Textbook: Haberman, Mathematical Modeling

The outline specifies 24 standard 50 minute periods of lectures, leaving the additional class periods for examinations, reviews, and extra time for difficult topics.

Two of the following three topics are to be covered in the class, with 4 weeks (12 periods) allocated for each:

I. Mechanical Vibrations.

First two weeks: Sections 1 – 14.
Newton's Law, applications to spring-mass systems, qualitative and quantitative behavior, initial value problems, multiple masses, damping phenomena.

Second two weeks: Sections 16 – 28.
Frictionless systems, equilibrium solutions, conservation of energy, phase plane solution curves, nonlinear oscillations, introduction of complicating features.

II. Population Dynamics.

First two weeks: Sections 30 – 41.
Models, difference equations, growth patterns, analysis of solutions to logistic equations, introduction of complicating features.

Second two weeks: Sections 42 – 54.
Difference equations, destabilizing influences, multiple species and predator-prey models, Lotka-Volterra equations and their solutions, effects of human influence, limitations of models.

III. Traffic Flow.

First two weeks: Sections 56 – 71.
Definitions and basic relationships for traffic velocity, flow and density, experimental observations and steady state models, solutions for the associated differential equations, traffic waves and uniform flow.

Second two weeks: Sections 42 – 54.
Disruptions which inhibit steady flow including congestion and stoppages, wave propagation and shock wave phenomena, effects of entering and exiting traffic.