Math 486 – Mathematical Modeling I

Course Description from Bulletin: The course provides a systematic approach to modeling applications from areas such as physics and chemistry, engineering, biology, and business (operations research). The mathematical models lead to discrete or continuous processes that may be deterministic or stochastic. Dimensional analysis and scaling are introduced to prepare a model for study. Analytic and computational tools from a broad range of applied mathematics will be used to obtain information about the models. The mathematical results will be compared to physical data to assess the usefulness of the models. Credit may not be granted for both MATH 486 and MATH 522. (3-0-3)(C)

Enrollment: Elective for AM and other majors.

Textbook(s): TBD

Other required material: None

Prerequisites: MATH 251, MATH 252 and MATH 332 (or equivalents); basic knowledge of probability and Matlab; or instructor's consent.

Objectives:
1.

3. Nonlinear dynamics (ODEs) – stability and bifurcation with applications to epidemics, pharmacokinetics, climate change   4
4. Diffusion models – advection, convection, bifurcation with applications to mixing and transport models, crime detection   8
5. Stochastic models – random walks, Brownian motion, stochastic differential equations with applications to statistical physics, finance   8
6. Exams and add-ons   5

Assessment:

Homework	10-25%
Computer Programs/Projects	10-20%
Exams	20-30%
Final Exam	20-30%

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