Department: MATHEMATICAL SCIENCES Semester Hours: 3

Course Title and Number: MATH 360 - MODEL BUILDING IN APPLIED MATHEMATICS

Course Description: An introduction to the formulation, analysis and interpretation of mathematical models in the study of selected problems in the natural, social and management sciences. Not open for credit to students having credit in MATH or STAT courses numbered 420 or above, except by consent of department.

PRQ: MATH 230.

Course Objectives:

- To engage effectively and efficiently in problem solving, as an individual and in cooperative situations.
- To understand and connect concepts of mathematics with real world problems and other scientific disciplines.
- To communicate mathematics clearly, in writing and orally.
- To use technology as a tool in the solution of real world problems.
- To develop creative thinking.
  (More detailed objectives appear in the Assessment Appendix.)

Content:

- The modeling process in general.
- Selected models covering a variety of real world connections such as:
  - Models involving proportion and geometric similarity.
  - Graphical and analytical model-fitting methods such as the least squares criterion.
  - Optimization problems.
  - Dimensional analysis.
  - Ordinary differential equations including population models and drug dose models.
  - Autonomous systems of differential equations including the competitive hunters model and the predator-prey model.

Course Requirements:

This course has Calculus (Math 230) as prerequisite and the models considered involve mostly mathematics up to that level. The emphasis will be on the creative process that goes with the development of mathematical models for real world situations. The students are required to work on the modeling projects (5 per semester) as part of a team. But each student is required to write a technical report of the project solutions for each project. Students are required to learn and use the technology (Excel and Word) required for the projects. Every student is required to present a portion of its group project and be evaluated by the other student teams.

Assessment Instruments: Completion of projects and quality of written reports on them. Quality of presentation on project work. Judgment on student involvement and contributions in class. Homework, quizzes and hour examinations. Final examination.

Textbook:

Giordano, Fox and Horton, **A First Course in Mathematical Modeling** (Custom edition for NIU), Cengage Learning Publishing Co. (2013)