0701M350
Mathematical Modeling

Instructor: TBA
Time: May 10, 2021-June 11, 2021
Office Hours: 2 hours (according to the teaching schedule)
Contact Hours: 60 (50 minutes each)
Credits: 4
E-mail: TBA

Course Description

In this course, students will learn how to formulate and analyze mathematical models. The mathematical tools to be handled include dimensional analysis, optimization, numerical simulation, elementary probability and stochastic processes, as well as elementary differential equations. The fields of application include biology, economics, and other areas of science.

Required Textbook(s)

No books required. The course notes will be distributed as we go.

Prerequisites

Calculus I or Linear Algebra or consent of instructor.

Technology

Access to Mathematica is preferred but not required.

Course Goals

The overall goal of this course is to enable students to learn how to formulate, analyze and simulate mathematical models.

Course Schedule

Week 1
- An Introduction to Modeling
- Dimensional Analysis
- Least Squares, Parameter Estimation
- Linear Models: generalized least squares estimators

Week 2
- Mathematical Models in Biology: population models
- Stability Analysis: equilibria, oscillations, growth and decay
- Optimal Control: business strategies

Week 3
- Markov Processes: modeling of chemical reactions
- Modeling of chemical reactions, stochastic differential equations
- Midterm Exam

Week 4
- Difference Equations: microscopic modeling of traffic flows
- Conservation Laws: macroscopic modeling of traffic flows
- Conservation laws, traffic flow when the light turns green

Week 5
- Poisson Processes: stock crashes
- Turing Patterns: modeling vegetation pattern formation
- Final Exam

Course Requirements

Reading
Reading the lecture notes and distributed articles, as well as watching the videos provided to you is an essential and required aspect of the course.

Homework
No late homework will be accepted. You are encouraged to make sure of the following resources: your classmates, course assistants and the notes. When you work in a team, you should write down all people's name in your term.

Exams
There will be one midterm and one final exam. If you must miss a midterm exam because of an approved conflict, please contact me as soon as possible, and no later than one week before the exam. Only simple, scientific calculators are allowed to use in the exam. No cell phone and laptop should be used in exams.

Grading Policy

Homework: 30%
Quizzes: 10%
Midterm exam: 30%
Final exam: 30%

Grading Scale

The instructor will use the grading system as applied by JNU:

Definition	Letter Grade	Score
Excellent	A	90~100
Good	B	80~89
Satisfactory	C	70~79
Poor	D	60~69
Failed	E	Below 60

Academic Integrity

As members of the Jinan University academic community, students are expected to be honest in all of their academic coursework and activities. Academic dishonesty, includes (but is not limited to) cheating on assignments or examinations; plagiarizing, i.e., misrepresenting as one's own work any work done by another; submitting the same paper, or a substantially similar paper, to meet the requirements of more than one course without the approval and consent of the instructors concerned; or sabotaging other students` work within these general definitions. Instructors, however, determine what constitutes academic misconduct in the courses they teach. Students found guilty of academic misconduct in any portion of the academic work face penalties that range from the lowering of their course grade to awarding a grade of E.