

**Mathematical Modeling (MATH 399), Winter 2022**  
**Thursday, December 22<sup>nd</sup> –Monday, January 16<sup>th</sup>**

---

**Instructor:** Nguyenho Ho, Ph.D.  
**Email:** [nho@bridgew.edu](mailto:nho@bridgew.edu)  
**Office Hours:** by appointments.

---

**Course Description**

This course provides an overview to mathematical modeling. More specifically, the course focuses on the fundamentals of developing and interpreting mathematical models based on physical, chemical, or biological systems. Students will learn how to build a model using both discrete and continuous mathematical concepts. Furthermore, they will learn how to formulate physical phenomena to mathematical models, validate the models, solve for viable solutions analytically and numerically, interpret the results obtained, provide explanations, and make further predictions to improve the models. Proportionality models, data fitting models, dimensional and sensitivity analysis, probabilistic modeling, and optimization are among the topics covered. This course is designed particularly for those who are interested in the more advanced mathematical issues that underpin mathematical modeling. Students may be expected to use computer languages such as Python.

**Course Goals**

By the end of this course, you will be expected to:

- formulate mathematical models using methods from both discrete and continuous mathematics;
- apply various problem-solving techniques to reach viable solutions;
- provide explanations and predictions of broad ranges of physical phenomena;
- use computer applications such as Python to aid in the design, simulation, forecasting, and explicating of models;

**Prerequisites**

A good background in differential and integral calculus, and linear algebra are required. Also, some exposure to ordinary differential equations, and elementary probability and statistics are strongly recommended. Some programming experience is preferred but not required.

**Grades**

The following factors will be used to determine your grade in this course:

Written Assignments.....	40%
Online Homework.....	15%
Midterm Exam.....	20%
Final Exam.....	25%
<hr/>	
Total score.....	100%

A	93%-100%	B	83-86%	C	73-76%	D	63-66%
A-	90-92%	B-	80-82%	C-	70-72%	D-	60-62%
B+	87-89%	C+	77-79%	D+	67-69%	F	59% or less

## Textbook

- *Recommended Texts:*
  - A First Course in Mathematical Modeling by Frank R. Giordano, William P. Fox, Steven B. Horton, 5th ed, Cengage, 2013.
  - Topics in Mathematical Modeling by K. K. Tung, 3rd ed, Princeton University Press, 2016

## Homework and Practice

- Problem solving is an integral part of this course, and the best way to develop this skill is to practice! The key to being successful in this class is independent practice of the material we cover in class. Therefore, it is crucial that you complete the homework assigned each week.
- There are four written assignments throughout the course. The due date of each assignment is
  - **Written assignment 1:** Tuesday, December 27<sup>th</sup>
  - **Written assignment 2:** Tuesday, January 3<sup>rd</sup>
  - **Written assignment 3:** Tuesday, January 10<sup>th</sup>
  - **Written assignment 4:** Monday, January 16<sup>th</sup>
- Multiple online homework will also be assigned throughout the course. The deadline of each homework will be determined at the time of assignment.

## Exams

The exams include one midterm exam and one final exam. The date of each exam is

- **Take-home Midterm:** Wednesday, January 4<sup>rd</sup>
- **Take-home Final:** Tuesday, January 17<sup>th</sup>

## Blackboard

Course materials for this section will be posted on Blackboard (Bb). Students should plan to check the site frequently for announcements and newly posted materials. You can access Bb from BSU's homepage. You will find the syllabus, homework assignments, exam and solutions, as well as other materials there. Grades will be periodically posted on the site. If you do not already have a Bb account, be sure to register for an account soon. You will need to register for this section's Bb course through the course catalog on the Bb website.

## Academic Integrity

The academic integrity policy of Bridgewater State University will be strictly enforced. This policy can be found in the BSU Student Handbook. Specifically, the policy requires that students do not cheat, fabricate, plagiarize, or facilitate academic dishonesty. Students who passively engage in cheating (i.e. allowing others to cheat off them) may receive the same consequences as the person copying.

## Student Accessibility Services

Bridgewater State University's commitment to students with disabilities is not only shaped by legal requirements but is also driven by our commitment to social justice and ensuring a fully accessible University experience to our community. Students with disabilities are encouraged to collaborate with Student Accessibility Services to confidentially explore accommodations and other resources available to them. SAS can be reached at SAS@bridgew.edu or 508.531.2194.