Mathematics (MATH) 480

Mathematical Modeling I (Revision 2)

Status:	Replaced with new revision, see the **course listing** ⬀ for the current revision ✖
Delivery mode:	**Individualized study** ⬀ with **eText** ⬀
Credits:	3
Area of study:	Science
Prerequisites:	**MATH 265** ⬀ , **MATH** ⬀ **266** ⬀ , **MATH** ⬀ **270** ⬀ , **MATH 370**, and **MATH 376** ⬀ , or equivalent courses from another university. **MATH** ⬀ **309** ⬀ is recommended, but not required.
Precluded:	None
Challenge:	MATH 480 is not available for challenge.
Faculty:	**Faculty of Science and Technology** ⬀

Overview

MATH 480 is designed as a first course in mathematical modeling, with an emphasis on model development and analysis using analytic methods. You will learn a variety of mathematical modeling approaches with applications in physical sciences, social sciences, finance, medicine, and business. Although mathematical theory that is new to you may be presented, we emphasize the application of mathematical methods to the study of real-world cases. Topics include both discrete and continuous dynamical-system-modeling approaches, stochastic modeling approaches, game theory, and optimization.

In this course, you will have the opportunity to build models yourself. A modeling assignment is included at the end of each unit.

Outline

- Unit 1: Basic Principles and the Process of Mathematical Modeling

- Unit 2: Modeling Change Using Difference Equations

- Unit 3: Modeling Change Using Differential Equations

- Unit 4: Modeling with Systems of Differential Equations

- Unit 5: Population Genetics Models

- Unit 6: Modeling with Decision Theory

- Unit 7: Game Theory

- Unit 8: Markov Processes

Objectives

Upon successful completion of this course, you will be able to

- differentiate between types of mathematical models in terms of their respective roles, including

  - empirical (phenomenological) versus theoretical (mechanistic) models,

- static versus dynamic models, and

- stochastic versus deterministic models.

- develop mathematical models of deterministic and probabilistic systems.

- identify and conduct appropriate methods to analyze mathematical models.

- effectively communicate the development, analysis, and subsequent conclusions of mathematical models to both technical and non-technical audiences.

Evaluation

To **receive credit** ⧉ for MATH 480, you must achieve an average of at least 50% on the eight assignments, a grade of at least 50% on the final project, and a course composite grade of at least **D (50 percent)** ⧉ .

The weighting of the composite grade is as follows:

Activity	Weight
8 Assignments (10% each)	80%
Final Project	20%
Total	**100%**

To learn more about assignments and examinations, please refer to Athabasca University's **online Calendar** ⧉ .

Materials

Giordano, F. R., Fox, W. P., & Horton, S. B. (2014.) *A first course in mathematical modeling* (5th ed.). Brooks/Cole. 📱 (eText)

eText

Registration in this course includes an electronic textbook. For more information on **electronic textbooks** ☐ , please refer to our **eText Initiative site** ☐ .

Important links

> **Academic advising** ☐

> **Program planning** ☐

> **Request assistance** ☐

> **Support services** ☐

Athabasca University reserves the right to amend course outlines occasionally and without notice. Courses offered by other delivery methods may vary from their individualized study counterparts.

Opened in Revision 2, March 11, 2022

Updated September 17, 2024

View **previous revision** ☐