

Mathematical Modeling of Processes

SYLLABUS

Instructor

Stefan Heinz Ross Hall 214, 766-4203, heinz@uwyo.edu
URL: <http://www.uwyo.edu/heinz/>
Office hours: T 1:00-3:00 pm, R 1:00-3:00 pm.
Also available by appointment, and often by simply dropping by.

Class Meeting

TR 9:35–10:50 am in EN 2070

Textbook

You may use the following books for further reading. Please note that we will not closely follow these books.

- 1) Allen, J. S., *An Introduction to Mathematical Biology*. Pearson Prentice Hall, Upper Saddle River, New Jersey (2007).
- 2) Allen, J. S., *An Introduction to Stochastic Processes with Applications to Biology*. Pearson Prentice Hall, Upper Saddle River, New Jersey (2003).
- 3) Meerschaert, M. M., *Mathematical Modeling*, Third Edition. Elsevier Academic Press, Burlington, San Diego, London (2007).
- 4) Heinz, S., *Statistical Mechanics of Turbulent Flows*. Springer-Verlag, Berlin, Heidelberg, New York, Tokyo (2003).

Course Objective

The course objective is to provide an overview of mathematical modeling involving difference equations, ordinary and partial differential equations. A specific course feature is given by the fact that all developments will be presented with regard to both deterministic and stochastic methods. Applications to finance and economics, chemistry and biology, fluid flow and turbulence will be discussed.

Course Topics

- 1) Deterministic Changes
- 2) Stochastic Changes
- 3) Deterministic Dynamical Systems
- 4) Stochastic Dynamical Systems
- 5) Deterministic Conservation Laws
- 6) Stochastic Conservation Laws

Prerequisites

- 1) Basic knowledge of ordinary and partial differential equations
- 2) Basic knowledge of probability concepts
- 3) Basic knowledge of the use of software to perform simple numerical calculations

Grading Scheme

50%	Homework
50%	Final Exam

Grade Requirements

A	> 90%
B	> 80%
C	> 70%
D	> 60%
F	< 60%

Homework: Homework is the most vital part of this course. Mathematics, more than most subjects, is one which you learn not by listening and absorbing, but by trying out yourself. The learning of mathematics is also more sequential than that of other subjects ... so all the more need to be regular in doing problems yourself! Homework assignments will be assigned approximately once in two weeks, and will be submitted to me on the specified due date (usually two weeks after the assignment), at the end of class. It is fine for you to discuss the homework with other students. However, please do not copy anyone else's work directly. Copying may adversely affect your grade; but more importantly, you won't be adequately preparing yourself for the tests in this way. If there are very good reasons that you could not submit your homework on the specified due date, you may turn in your homework later but before I returned the graded homework. Homework submitted later than this return day will not contribute to your grade.

Tests: There will be one final exam which will be comprehensive.
The finals week is May 5-9.

Attendance/Participation: I strongly recommend class participation and attendance and consider this activity essential in determining borderline grades.

Disability statement: If you have a physical, learning, or psychological disability and require accommodations, please let me know as soon as possible. You will need to register with, and provide documentation of your disability to, University Disability Support Services (UDSS) in SEO, room 330 Knight Hall, 766-6189, TTY: 766-3073.