

Mathematical modeling of processes (5320)

SYLLABUS

Instructor

Stefan Heinz, Ross Hall 214, 766-4203, heinz@uwyo.edu

Office hours MWF 2:10–3pm. Also available by appointment, and often by simply dropping by.

Class Meeting

MWF 1:10–2:00 pm, Ross Hall 308

Textbook

Stefan Heinz, *Statistical Mechanics of Turbulent Flows*, 1st ed., Springer, Berlin, 2003.

Contents

The course presents an overview of basic ways to calculate turbulent flows of engineering and environmental interest. First, basic properties of stochastic models (probability density functions and transport equations for them) are explained. This knowledge is a requirement to understand the structure of modern turbulence models. The use of stochastic models for molecular dynamics then allows to derive the basic equations of fluid and thermodynamics as a consequence. However, the use of these equations is much too expensive to solve realistic problems. Conventional ways to handle this problem (the use of averaged or filtered equations) suffer from serious closure problems, in particular for reacting flows. It will be explained that the application of stochastic turbulence models (which generalize conventional closure models) represents the most promising way to calculate turbulent flows of practical relevance. The structure of such models, their advantages and applications to turbulent reacting flow simulations are discussed in detail.

Prerequisite

Graduate studying in Engineering, Physics or Mathematics

Grading Scheme

40%	Homework
30%	Mid Term Exam
30%	Final Exam