Instructor: M.Carme Calderer (www.math.umn.edu/mcc)
Office: Vincent Hall 507
e-mail: mcc@math.umn.edu
Office Hours: Thursday, 4:30-5:45 pm, and Wednesday, 4:35-5:50 pm.

Course sources: Class notes are an important component of the course materials. Students are encouraged to take and maintain good class notes.

Textbooks:
A reference book for the course is *Principles of Applied Mathematics* by James P. Keener; Westview, 2000. (I would recommend buying it used, if you decide to buy it).
The following books will also be used in the course. They are either available on line or will be placed on hold at the Library.
*Practical Applied Mathematics* by Sam Howison; Cambridge Texts in Applied Mathematics, 2005 (online).

Course description: This course is the first part of a two-semester sequence aimed at providing a solid background on ideas and methods of applied mathematics. The two parts of the sequence (Math 8401 and Math 8402) may be taken independently. Both courses are aimed at graduate students in mathematics, sciences and engineering.
In Applied mathematics, we study problems arising in other disciplines, including science and engineering. One of the tasks in applied mathematics is the formulation of a problem in mathematical terms, that is, the construction of a model that stands up to mathematical scrutiny. In some cases, a model can be formulated as a system of differential equations. As crucial as providing tools to solve the problems, applied mathematics seeks common conceptual features among vastly different problems.
Applied mathematics consists of an entire universe of subjects and themes, and therefore, many different courses could be designed to fit the title. However, nature and technology often reveal themselves in such ways that common threads can be drawn from very different problems. This course will seek a balance between modeling, based on case studies and examples, and analysis. Although modeling is an important component of the course, a main effort will be devoted to the theory, especially analytical methods directed towards differential equations, ordinary and partial.
Math 8401 addresses topics of ordinary differential equations, scaling, perturbation methods, distributions, Green's functions and boundary value problems, topics from partial differential
equations, bifurcation methods for nonlinear equations, and systems of balance laws. Examples from the theory of liquid crystals and nonlinear elasticity will be emphasized. We will conclude the fall semester with an introduction to stochastic processes.

**Assignments and Examinations:** There will be bi-weekly homework assignments, one (50-minutes, in-class) midterm examination, one take-home test, and the final examination (in class).

The grade of the course will be based upon a weighted average of the homework and the three examinations:

- Homework mean: 20% towards the final grade.
- Test I (Friday, Friday, October 14, 9:9:50 am): 20 % towards the final grade.
- Test II (take-home test; Friday, November 18): 30 %. The completed test should be submitted no later than Friday, November 25 at 5 pm.
- Final examination: (According to UofM schedule): 30 % towards the final grade.