

TMA4195 Mathematical Modeling

Curriculum, Fall 2011:

The curriculum consists of the following parts:

- Selected parts of *The lecture note of Krogstad* (see below).
- *Homework problems* 1 - 9.
- *Phase-plane analysis of systems of ODEs*.

You should master the material in chp. 4.3-4.5 in Kreyszig: *Advanced Engineering Mathematics*, 9th edition (chp. 3.3-3-5 in 8th ed.).

- *Boundary value problems for conservation laws*. Copies from lectures:

<http://wiki.math.ntnu.no/tma4195/2011h/notes/ConservationLawsAndBC.pdf>

Detailed curriculum from *The lecture note of Krogstad*:

1. *Dimensional analysis, scaling, and regular perturbation*

All the material belong to the curriculum, except sections

1.3.3, 1.3.5, 1.3.6; 2.2.

2. *Singular perturbation and chemical reaction kinetics*

Copies from Lin and Segel [1]. All the material belong to the curriculum, except sections

9.1; 10.2 from *Higher approximations* page 311.

3. *Stability and bifurcations in dynamical models*

Copies from Logan [2]. All the material belong to the curriculum, except *Exchange of stability* pages 368-373.

4. *Population models*

All the material belong to the curriculum, except sections

2.2; 3; 7.

Section 6 is background material, there will be no detailed questions from this part on the exam.

5. *Modeling based on conservation principles.*

All the material belong to the curriculum, except sections

3.1.5, 3.3, 3.4; 4.5.3; 5.5, 5.6; 6; 7.

Section 3.2 is background material, there will be no detailed questions from this part on the exam.

References

- [1] C. C. Lin and L. A. Segel. *Mathematics applied to deterministic problems in the natural sciences*. SIAM, 1988.
- [2] J. D. Logan. *Applied mathematics. A contemporary approach*. 1st edition. Wiley, 1987.