

TMA4195 Mathematical Modeling

Curriculum, Fall 2017:

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, 10th (or 9th) edition.
- Boundary value problems for conservation laws. *Copies from lectures:*

<https://www.math.ntnu.no/emner/TMA4195/2017h/notes/ERJ/ConservationLawsAndBCv2012.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; 2.4.
2. *Singular perturbation and chemical reaction kinetics.* Copies from [1].
Everything except sections
9.1; 10.2 from *Higher approximations* page 311.
3. *Stability and bifurcations in dynamical models.* Copies from [2].
Everything except *Exchange of stability* pages 368-373.
4. *Population models.*
Everything except sections
2.2; 3.
Section 6 is background material. No detailed questions on the exam.
5. *Modeling based on conservation principles.*
Everything except sections
3.1.5, 3.3; 4.5.3; 5.4, 5.5; 6; 7.
Section 3.2 is background material. No detailed questions 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.