

ORDINARY DIFFERENTIAL EQUATIONS, 5 credits
Ordinära differentialekvationer (7.5 ECTS credits)

C level
ODE850

Syllabus approved by the Academic Board of the School on May 11, 2005. Effective starting spring term 2006.

PLACEMENT IN THE ACADEMIC SYSTEM

The course is included as an elective course in the Master's Programme in Computer Systems Engineering or Electrical Engineering.

PREREQUISITES AND CONDITIONS FOR ADMISSION

The lecture course is intended for master and PhD students. No previous knowledge is required. Usual mathematics courses in analysis and linear algebra are proposed.

PURPOSE AND OBJECTIVES

The goal of this course is to give an introduction into the most modern tools in mathematics.

The main subject will be the theory of ordinary differential equations which is at present actively used by modeling different processes in natural science and engineering.

PRIMARY CONTENTS

1. First order differential equations, types of equations, qualitative and analytical methods, examples and applications. Mathematical models: mixing problems, populations models, heating, etc. Numerical methods: Eulers method, better numerical methods, finite accuracy.
2. Second order differential equations.
 - a. Linear differential operators, fundamental solutions. Applications of linear second order differential equations: harmonic motion, forced vibrations, electrical circuits. Numerical methods.
 - b. Nonlinear differential equations, methods of solving second order differential equations. Applications.
3. Higher order linear differential equations.
 - a. Homogeneous linear differential equations with constant coefficients.
 - b. Method of variation of parameters. Examples.
4. Systems of differential equations and their applications.
 - a. Analysis of electrical network.
 - b. Elimination method for linear system, solving linear systems and their applications
 - c. Nonlinear autonomous systems
 - d. Matrix methods.
5. Application to a network simulation.

INSTRUCTION AND EXAMINATION OF STUDENTS

Lectures, task for home works, discussions seminars, a written examination at the end of the course. Grades for the entire course are assigned on the scale Fail (U), 3, 4, and 5 (the grading system used in most Swedish, technical educations where 3 is the equivalent to a Pass).

COURSE EVALUATION

After completion of a course, the director of studies is responsible for giving the students the opportunity to make an evaluation of the course. The course evaluation shall serve as a guide for further development and planning of the course. Participants in course evaluations shall be anonymous. The results are distributed to concerned directors of studies, lab instructors, teachers and students. Thereafter a compilation is made of the results and subsequent measures, and reported to the school board of directors.

COURSE LITERATURE

R. K. Nagle, E. B. Saff, *Fundamentals of differential equations*, The Benjamin/Cummings Publishing Company, Inc Redwood City, California, 1989 (or later).

J. H. Hubbard, B. H. West, *Differential equations. Dynamical systems approach. Part I, Part II*. In "*Text in Applied Mathematics*", Springer Verlag, New York, 1991 (or later).

