Level: bachelor

Course title: Ordinary Differential Equations (M4-14)

Status: obligatory

ECTS: 7

Requirements: passed exam in course Analysis 2 (M4-08)

Learning objectives

To introduce students to the basic concepts of differential equations, the problems of existence and uniqueness of solutions, and basic methods of solving ordinary differential equations.

Learning outcomes

Minimal

Students will understand the basic concepts and learn techniques for solving differential equations.

Desirable

Students should develop a sense for qualitative analysis of differential equations, and show the ability to independently create models of various phenomena.

Syllabus

Theoretical instruction

First order differential equations. Direction fields and integral curves. Autonomous equations. Some existence and uniqueness theorems. Dependence of solutions on the initial conditions and parameters. Solution prolongation. Method of successive approximations. Linear equations, homogeneous equations, exact equations. Differential equations in implicit form. The Laplace transform.

Systems of differential equations. Existence and uniqueness. Linear systems. Homogeneous and nonhomogeneous systems. Linear systems with constant coefficients. Fundamental set of solutions.

Linear equation of *n*-th order, homogeneous and nonhomogeneous equations, the variation of parameters. Equations with constant coefficients. Series solutions of differential equations, ordinary points and regular singular points.

Analysis of solutions of differential equations: stability of solutions, critical points, equilibrium states.

Applications of differential equations to modelling in physics, biology, economics and other sciences.

Practical instruction

The problem sessions contain exercises, tasks and problems that fully follow the content of the lectures.

Weekly teaching load				Other: 0
Lectures: 3	Exercises: 3	Other forms of teaching: 0	Student research: 0	