Study programme(s): Mathematics (M), Applied Mathematics (MAP)
Course title: ORDINARY DIFFERENTIAL EQUATIONS (M118)
Lecturer(s): Dora Seleši
Course status: compulsory (M), compulsory on modules: Techno-mathematics, Mathematics of Finance (MAP)
ECTS points: 7
Requirements: Analysis 1 (on M), Differential and Integral Calculus (on MAP), Analysis 2 (on M), Multidimensional Analysis (on MAP)

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 the qualitative analysis of differential equations and show the ability to independently create models of various phenomena.

Syllabus

Theoretical instructions

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. Extension of a solution. 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 equations of nth 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, economy and other sciences.

Practical teaching:

The problem sessions involve exercises, tasks, and problems, that in full content accompany the lectures**.**

Literature

1. V. Marić, M. Budinčević: **Diferencijalne i diferencne jednačine**, Prirodno-matematički fakultet, Novi Sad, 2005.
2. M. Bertolino, **Diferencijalne jednačine**, Zavod za udžbenike, 2010.
3. W.E. Boyce, R. C. DiPrima, **Elementary Differential Equations and Boundary Value Problems**, Wiley, 2009.
4. G. Teschl, **Ordinary Differential Equations and Dynamical Systems**, AMS, 2012.
5. V. I. Arnol'd, **Ordinary Differential Equations**, Springer, 1992.

Number of active classes	Lectures: 3	Exercises: 3

Teaching methods			
Classic plenary lectures supported by presentations on the computer. Discussion with students. Practical teaching is focused onto solving of exercises, typical problems, examples and practical applications.			
Grading (maximum number of points 100)			
Pre-exam obligations	Points	**Final exam**	Points
colloquia	**60**	oral exam	**40**