Study program : Mathematics

Type and level of studies: Undergraduate academic studies

Course unit: Numerical mathematics

Teacher in charge : Marija Stanic

Language of instruction (*English or other foreign language*) English

ECTS: 9

Prerequisites: Mathematical analysis 1, Mathematical analysis 2, Mathematical analysis 3, Mathematical analysis 4, Functional analysis

Semester*(Winter Semester or Summer Semester)* Summer

Course unit objective

Understanding of the theory of errors, the interpolation of function, as well as the easiest method for numerical differentiation, numerical integration, iterrative processes, as well as numerical methods for the solving of ordinary differential equations. Knowing and using the software package Mathematica.

Learning outcomes of Course unit

The student has acquired the necessary theoretical knowledge of the theory of errors, interpolation of functions, numerical differentiation, numerical integration, iterrative processes, and numerical methods for the solving of ordinary differential equations. The student is trained to use the software package Mathematica.

Course unit contents

Theoretical classes

The theory of errors. Computation with approximate numbers and types of errors. Significant and secure figures. Mechanical numbers and computer arithmetic. Error of the function (direct and inverse problem). **Interpolation.** The interpolation of functions. Chebyshev systems. Calculus of finite differences. Interpolation polynomials. Error of interpolation. **Numerical differentiation. Numerical integration.** Primitive quadrature formulas. Newton-Cotes's quadrature formulas. Generalized quadrature formulas. **Solution of the equations by iterations**. Localization solutions of equations. Iterative processes. Newton's method. The secant method. The bisection method. **Numerical methods for the solving of ordinary differential equations**. An approximate analytical method. Linear multistep methods. Runge-Kutta methods.

Practical classes

Application of the acquired theoretical knowledge in solving problems. Solving problems using the software package Mathematica.

Literature

1. E. Sully, D. F. Mayers, *An Introduction to Numerical Analysis*, Cambridge University Press, 2003.

2. W. Gautschi, *Numerical Analysis*, Birkhauser, 2012.

Number of active teaching hours				**Other classes**
Lectures:	Practice:	Other forms of classes: *mentoring system* 1	Independent work: 5	

Teaching methods

Examination methods (maximum 100 points)

Exam prerequisites	**No. of points:**	**Final exam**	**No. of points:**
Student's activity during lectures		oral examination	*50*
practical classes/tests	**50**	written examination	
Seminars/homework		.....	
Project			
Other			

Grading system

Grade	**No. of points**	**Description**
10	**91-100**	Excellent
9	**81-90**	Exceptionally good

8	**71-80**	Very good
7	**61-70**	Good
6	**51-60**	Passing
5	**0-50**	Failing

(Table 5.2) Course unit description