Study program : Informatics

Type and level of studies: Undergraduate academic studies

Course unit: Numerical Mathematics and Symbolic Computation

Teacher in charge : dr Tatjana Tomović, Assistant Professor

Language of instruction: English

ECTS: 6

Prerequisites:

Semester: *Summer Semester*

Course unit objective

The course offers an introduction to numerical mathematics precisely to the basic tehniques fot the efficient numerical solution of problems. The course unit aims to introduce students to theoretical and practical aspects of the numerical solution of nonlinear equations a, error analysis, the approximation of functions by polynomials, numerical differentiation, numerical integration and direct and iterative methods in linear algebra.

Learning outcomes of Course unit

On completion of this unit successful students will have:

- understanding of the theory of errors,
- practical knowledge of polynomial interpolation, its numerical implementation and theoretical knowledge of associated approximation properties;
- knowledge of numerical integraion and differentiation;
- practical knowledge of a range of iterative techniques for solving linear and nonlinear systems of equations, theoretical knowledge of their convergence properties.

The student masters basic techniques for analyzing a large selection of numerical algorithms. The student is able to implement the algorithms in Mathematica.

Course unit contents

Theoretical classes

Errror analysis (Absolute error and relative error, Truncation error and rounding error. Error of the function (direct and inverse problem)), **Interpolation** (The interpolation of functions. Chebyshev systems. Calculus of finite differences. Lagrange and Newton interpolation polinomials. Error of interpolation), **Numerical Differentiation, Numerical Integration** (Newton-Cotes's quadrature), **Numerical solution of nonlinear equation** (Interval method. Newton's method. Secant method. Convergence rates and stopping criteria), **Numerical methods in Linear Algebra** (Gaussian elimination. Simple iteration. Jacobi Method. Gauss-Seidel Method. Convergence of Iterative Methods)

Practical classes

The application of theoretical knowledge to solve problems. Implementation of the methods in Mathematica.

Literature

- Endre Suli, David Mayers, An Introduction to Numerical Analysis, Cambridge University Press, 2003.
- W. Gautschi, Numerical Analysis, Birkhauser, 2012.
- Mark S. Gockenbach, Mathematica Tutorial, SIAM, 2010.
- http://www.math.mtu.edu/~msgocken/pdebook2/mathtut2.pdf

Number of active teaching hours				**Other classes**
Lectures: 30	Practice: 30	Other forms of classes 15	Independent work:	

Teaching methods

Examination methods (maximum 100 points)			
Exam prerequisites	**No. of points:**	**Final exam**	**No. of points:**
Student's activity during lectures	**4**	oral examination	**50**
practical classes/tests	**46**	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