Study program : Mathematics

Type and level of studies: Master academic studies

Course unit: Numerical Analysis 2

Teacher in charge : dr Tatjana Tomović, Assistant Professor

Language of instruction: English

ECTS: 10

Prerequisites: Numerical Mathematics, Numerical Analysis 1

Semester: *Summer Semester*

Course unit objective

The course offers an introdction to numerical solutions to ordinary differential equations, elliptic, hyperbolic and parabolic partial differential equations and integral equations.

Learning outcomes of Course unit

The student will obtain a solid introduction to the theory of numerical methods for ordinary differential equations, partial differential equations and integral equations (with derivations of the methods and some proofs). They will learn to implement the computational methods efficiently in Mathematica.

Course unit contents

Theoretical classes

Ordinary differential equations (boudary problems) Shooting method. Finite Difference Method. Finite Element Methods. Ritz method. Galerkin method. Colocation.

Partial differential equations Classification of PDEs. Numerical solution of partial eliptic, hiperbolic and parabolic equations. Finite Difference method.

Integral equations The Numerical Solution of Fredholm integral equations. Determinant method. Successive kernels method. Degenerate kernels.

Practical classes

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

Literature

- Gordon C. Everstine,Numerical solution of Partial Differential Equations, 2010.
- E. Hairer, S.P. Norsett, G. Wanner, Solving Ordonary Differential Equations I, Second Revised Edition, 1993, 1987 Springer-Verlag Berlin Heidelberg
- Endre Suli, David Mayers, An Introduction to Numerical Analysis, Cambridge University Press, 2003
- Mark S. Gockenbach, Mathematica Tutorial, SIAM, 2010.
- Yury V. Shestopalov, Yury G. Smirnov, Integral Equations, Karlstad, 2002.
- http://www.math.mtu.edu/~msgocken/pdebook2/mathtut2.pdf

Number of active teaching hours				**Other classes**
Lectures: 60	Practice: 45	Other forms of classes	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