M137	**Practicum in Applied Mathematics**	L	P	S	ECTS
		2	2	1	7

Course objectives. Course objectives are to introduce students to modelling, solving, and interpreting mathematical problems that occur in applications, to analyse known numerical methods and to know how to choose a suitable method for a given problem, to adjust it to the structure of the problem and to interpret obtained results in terms of the initial problem.

Prerequisites. Undergraduate study of mathematics or computer science, Partial differential equations.

Course content.

1. One-dimensional and multidimensional optimization with or without constraints on real mathematical problems from applications. Optimization problems in economics, industry, engineering.
2. Partial differential equations in applications. Application of basic partial differential equations (Laplace, Poisson, wave, heat equation) in physical, chemical and biological processes and various engineering problems.

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Model optimization problems that occur in applications.
2.	Apply methods for one-dimensional and multidimensional optimization with or without constraints to real mathematical problems from applications.
3.	Identify and model problems that can be described by partial differential equations.
4.	Use programming tools to implement standard methods.
5.	Adjust standard methods for solving problems to concrete applications.
6.	Interpret the results obtained in terms of the initial problem from applications.

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ASSESSMENT OF THE LEARNING OUTCOMES

TEACHING ACTIVITY	ECTS	LEARNING OUTCOME **	STUDENT ACTIVITY*	EVALUATION METHOD	POINTS	
					min	max
Attending lectures and exercises	1	1-6	Lecture attendance, discussion, team work and independent work on given tasks	Attendance lists, monitoring of classroom activities, closed-ended assignments	0	4
Homework	1	1-6	Independent problem solving	Checking the correct solutions (evaluation)	0	4
Written exam (Mid-terms)	2	1-6	Preparing for written exam	Checking the correct solutions (evaluation)	25	46
Final exam	3	1-6	Revision	Oral exam	25	46
TOTAL	7				50	100

Teaching methods and student assessment. Lectures, exercises and seminars are obligatory. The exam consists of a written and an oral part. Upon completion of the course, students can

take the exam. Successful midterm exam scores replace the written exam. The exercises are laboratory using a computer. Students can influence the grade by writing homework or writing a seminar paper during the semester.

Can the course be taught in English: Yes

Basic literature:

1. D. Bertsimas, J. N. Tsitsiklis, Introduction to Linear Optimization, Athena Scientific, 1997
2. R. Scitovski, N. Truhar, Z. Tomljanović, Metode optimizacije, Sveučilište Josipa Jurja Strossmayera u Osijeku, Odjel za matematiku, Osijek, 2014.
3. Zangxin Chen, Finite Element Methods and Their Applications, Springer, Berlin, 2005
4. A. Quateroni, A. Valli, Numerical Approximation of Partial Differential Equations, Springer Series in Computational Mathematics Vol. 23, Springer Verlag,1994.

Recommended literature:

1. G. Sierksma, Linear and Integer Programming, Marcel Dekker, Inc., Nemhauser, 1999.
2. C.T.Kelley, Iterative methods for optimization, SIAM, Philadelphia, 1999.
3. L. C. Evans, Partial differential equations, AMS, 1998.
4. M. Renardy, R. C. Rogers, An introduction to partial differential equations, Springer Verlag, 1993.
5. P. Knabner, L. Angerman, Numerical methods for elliptic and Parabolic PDEs, Springer Verlag, 2003.
6. R. LeVeque, Numerical Methods for Conservation Laws, Lecture Notes in Mathematics, Birkhäuser, Basel, 1992.