M063	**Applications of Calculus II**	L	S	E	ECTS
		1	0	2	4

The aim of the course. Familiarize students with the application of basic concepts and techniques covered in courses Multivariable Calculus, Complex Analysis and Ordinary Differential Equations. The problems related to the application in various fields such as physics, economics, biology and chemistry will be considered.

Prerequisites. Multivariable Calculus. Complex Analysis. Ordinary Differential Equations.

Course content.

1. Problems of extremes and conditional extremes with some applications in geometry, physics, economics, biology and chemistry.
2. Applications of integrals. Computations of length, areas and volumes. Calculations of value of magnitude (mass, charge etc.) if density of this magnitude is known. Computations of coordinates of the center of mass and moment of inertia, computation of the work of force.
3. Applications of vector analysis. Potential and solenoidal fields. Problems of motion. Derivation of physical laws and equations (e.g., the law of conservation of energy in the potential (conservative) force field, equation of transverse oscillations of an elastic string from the law of conservation of momentum).
4. Applications of complex analysis. Computation of real integrals. Applications of conformal mappings. Harmonic functions and the Dirichlet problem for Laplace equation. Stationary plane fluid flow.
5. Applications of differential equations in geometry, physics, economics, biology, chemistry and medicine (e.g., chase curves, mechanical vibrations, electric circuits, the dynamics of chemical reaction, models of consumer behavior, population models, models of epidemics).

LEARNING OUTCOMES

Num.	LEARNING OUTCOMES
1.	Use calculus to solve optimization problems in geometry, physics, economics, biology and chemistry.
2.	Use and apply integrals in various research fields and interprete obtained results.
3.	Use vector calculus for derivation of various physical laws.
4.	Solve various problems in real analysis using complex analysis.
5.	Use differenital equations to model and solve a variety of problems in geometry, physics, economics, biology, chemistry and medicine.

CONNECTING LEARNING OUTCOMES, ORGANIZATION OF TEACHING PROCESS AND ASSESSMENT OF STUDENT LEARNING OUTCOMES

TEACHING PROCESS ORGANIZATION	ECTS	LEARNING OUTCOME **	STUDENT ACTIVITY*	EVALUATION METHOD	SCORE	
					min	max
Lecture attendance	1	1-5	Attending lectures, discussions, teamwork and individual work on tasks	Participant lists, monitoring activities on class	0	4
Mid-term exam (preliminary exam)	1	1-5	Prepairing for written exam	Checking the correctness of solutions	25	48
Final exam	2	1-5	Revision of subject matter	Oral exam	25	48
TOTAL	4				50	100

Teaching and evaluation of knowledge. Attendance at lectures and exercises is required. The exam consists of written and oral part, and can be taken after completion of lectures and exercises. During the semester students can take colloquiums that replace the written examination.

Can the course be taught in English: Yes.

Basic literature:

1. J. Stewart, Calculus 7th Edition, McMaster University and University of Toronto, Brooks/Cole, Cengage Learning, Belmont, 2008.
2. A. Sveshnikov, A. Tikhonov, The theory of functions of a complex variable, Mir Publishers, Moscow, 1978.
3. D. N. Burghes, M. S. Borrie, Modelling with differential equations, Ellis Horwood Ltd., 1981.

Additional literature:

1. W. E. Boyce, R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 7th edition, John Wiley & Sons, 2000.
2. B. P. Demidovič, Zadaci i riješeni primjeri iz više matematike s primjenom na tehničke nauke, Tehnička knjiga, Zagreb, 1986
3. S. Kurepa, Matematička analiza 3: Funkcije više varijabli, Tehnička knjiga, Zagreb, 1984.
4. J. D. Murray, Mathematical Biology I: An introduction, New York, Springer, 2002.