M107	**Methods of mathematical physics**	L	S	E	ECTS
		3	0	2	7

Course objectives. Introduce students with some fundamental equations of continuum mechanics, their properties and basic methods for studying and solving them.

Course prerequisites. Multivariable Calculus, Ordinary Differential Equations

Syllabus.

1. Introduction. Continuum, and derivation of equations of continuum: heat diffusion, and transversal oscillations of vibrating string. Boundary conditions. Boundary, initial, and initial-boundary value problem for partial differential equations. Classification of second-order partial differential equations.
2. Equations of equilibrium of continuum. Boundary problems for string equilibrium. Concentrated load. Green function. Variational formulation and energy functional. Calculus of variation, Finite elements methods.
3. Equations of motion of continuum. Initial value problem for wave equation and diffusion equation. D'Alambert and Poisson formula. Initial-boundary value problem for wave equation and diffusion equation. Fourier method of separation of variables. Fourier series. Laplace and Poisson equation. Sturm-Liouville problem.

LEARNING OUTCOMES

Num.	**LEARNING OUTCOMES**
1.	Identify some problems of continuum physics and model them with (partial) differential equations.
2.	Identify different types of boundary conditions and methods for their realizations.
3.	Clearly explain main properties and differences between initial value, boundary value, and initial-boundary value problems, as well as methods for studying them.
4.	Classify partial differential equations od second order.
5.	Solve boundary value problems for equilibrium of continuum.
6.	Use basics of calculus of variations for solving boundary value problems.
7.	Solve initial value problem for wave equation using D'Alambert formula, and initial value problem for diffusion equation using Poisson formula.
8.	Recognize and clarify characteristic properties of linear equations.
9.	Use method of separation of variables and Fourier series for solving linear partial differential equations.
10.	Clearly explain their conclusions to experts and laity, based on knowledge and arguments.

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	1-10	Attending lectures, discussions, teamwork and individual work on tasks	Participant lists, monitoring activities on class	0	4
Mid-term exam (preliminary exam)	3	1, 2, 5, 6, 7, 9, 10	Preparation for written exam	Checking the correctness of solutions	25	48
Final exam	3	1-10	Revision of subject matter	Oral exam	25	48
TOTAL	7				50	100

Teaching methods and student assessment. Lectures and exercises are mandatory. The exam consists of a written and oral part and is taken after the completion of lectures and exercises. Acceptable scores achieved in mid-term exams taken throughout the semester replace the written part of examination.

Can the course be taught in English: Yes.

Basic literature:

1. I. Aganović, K. Veselić, Jednadžbe matematičke fizike, Školska knjiga, Zagreb, 1985.
2. I. Aganović, K. Veselić, Linearne diferencijalne jednadžbe. Uvod u rubne probleme, Element, Zagreb, 1997.
3. I. Aganović, K. Veselić, Matematički modeli i metode, Sveučilište J. J. Strossmayera u Osijeku – Odjel za matematiku, Osijek, 2014.

Recommended literature:

1. E. A. Gonzales-Velasco, Fourier analysis and Boundary Value Problems, Elsevier Science & Technology Books, 1996