Study program	Level of studies		**First cycle**	
	Study program name		**Physics Education**	
Course name	**MATHEMATICS II**			
Course ID	Semester	Course status	ECTS credits	L+E
PMAT150	**II**	**MANDATORY**	**8**	**4+4**
Lecturer				
Aims and intended learning outcomes	The objective of the course is for students to master fundamental knowledge in integral calculus of real functions of one real variable and ordinary differential equations, and to understand their importance and application in physics. The expected learning outcomes are as follows: 1. Differentiate between types of integrals and solve them using various methods. 2. Estimate integral values and examine convergence. 3. Apply integral calculus to solve problems in geometry and physics. 4. Expand a function to Fourier series and apply Fourier transformation. 5. Solve various types of ordinary differential equations of first and second order and simpler systems of differential equations. 6. Distinguish between types of solutions and solve problems with initial and boundary values. 7. Utilize a formal presentation style (definition/theorem/proof or examples of use).			

Course content

Primitive function. Indefinite integral. Method of substitution and method of partial integration. Integration of rational, some irrational, and trigonometric functions. Definite integral. Method of substitution and method of partial integration in a definite integral. Properties and classes of integrable functions. Mean value theorems. Relationship between definite and indefinite integrals (fundamental theorem of differential and integral calculus). Improper integral and convergence criteria. Surface area, arc length, volume, and surface area of revolution. Some applications of integral calculus in physics (mechanics, electrostatics, gravity).
Trigonometric and Fourier series. Expansion of a function into a Fourier series. Convergence. Fourier transformation. Some applications in physics.
First-order ordinary differential equations. Cauchy's initial value problem. General, particular, and singular solutions. Types of ordinary differential equations that can be integrated. Higher-order ordinary differential equations (Cauchy's problem, solutions). Linear second-order differential equations with constant and non-constant coefficients. Boundary value problem. Systems of linear differential equations with constant coefficients. Some applications in physics.

Student workload (hours)		Grading	
Lectures and Exercises	120	Assessment method	Points
Exam preparation	80	Midterm exam	50
Total	200	Final exam	50
		Total	100

Literature

1. S. Hassani, Mathematical Methods for Students of Physics and Related Fields, 2nd ed., Springer-Verlag, New York, 2009.
2. S. Kalabušić, E. Pilav, Obične diferencijalne jednadžbe, Sarajevo: Prirodno-matematički fakultet, 2014.
3. V. A. Zorich, Mathematical Analysis I, 2nd ed., Springer-Verlag, Berlin, 2015.

Remarks