Study program	Level of the study program		**Second cycle**	
	Study program name		**Physics Education**	
Course name	**COMPUTATIONAL PHYSICS II**			
Course ID	Semester	Course status	ECTS credits	L+E
PCS8612	**II**	**MANDATORY**	**6**	**2+2**
Lecturer				
Aims and intended learning outcomes	The aim of this course is to introduce students to basic numerical methods and equip them for the practical application of computers in modeling and analyzing physical systems and processes. It is expected that students will gain a fundamental understanding of numerical methods, apply them to solve complex physical problems, and develop skills in critical thinking and analytical approaches in this context. The expectation is that the acquired knowledge will serve as a foundation for further academic advancement and research in the field of physics.			

Course content

Introduction. Sets, vectors, matrices, and linear transformations. Solving systems of linear equations. Eigenvalues and eigenvectors. QR method. Least squares method. Interpolation. Solving transcendental equations. Numerical differentiation. Numerical integration. Ordinary Differential Equations (ODE) - initial value problems. ODE - boundary value problems. Fourier transformations. Fast Fourier Transform (FFT). Data processing and analysis. Machine learning.

Student workload (hours)		Grading	
Lectures and Exercises	75	Assessment method	Points
Exam preparation	70	Test I	50
Written assignments	0	Test II	50
Other	5		
Total	150		
		Ukupno	100

Literature

1. Kong, Qingkai, Timmy Siauw, and Alexandre Bayen. *Python programming and numerical methods: A guide for engineers and scientists*. Academic Press, 2020.
2. Johansson, Robert. *Numerical Python: Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib*, Apress, Berkeley, CA, 2019.
3. Landau, Rubin H., Manuel J. Páez, and Cristian C. Bordeianu. *Computational physics: Problem solving with Python*. John Wiley & Sons, 2015.

Remarks

To pass the exam, a minimum score of 55% is required on each type of assessment. The exams are practical in nature, involving the solution of specific physics problems using a computer.