

Study program	Level of studies		First cycle	
	Study program name		Physics Education	
Course name	SELECTED TOPICS IN MODERN PHYSICS I			
Course ID	Semester	Course status	ECTS credits	L+E
PTH5712	V	MANDATORY	7	3+3
Lecturer				
Aims and intended learning outcomes	<p>The goal of the course is to provide students with a basic knowledge of modern physics (20th century physics), its postulates, results and applications, especially in the areas of special relativity and quantum mechanics.</p> <p>It is expected that a student who passes the course will be able to:</p> <ul style="list-style-type: none"> - Interpret the basic principles of the theory of relativity and quantum mechanics. - Derive and apply Lorentz transformations. - Solve the Schrödinger equation for cases such as potential well, harmonic oscillator, and hydrogen atom. - Solve computational problems in the theory of relativity and quantum mechanics. 			
Course content				
<p>Introduction to the theory of relativity. Galilean transformations. Experimental foundations of special relativity. Postulates of special relativity and their direct consequences. Lorentz transformations. Consequences of Lorentz transformations. Length contraction and time dilation. Law of addition of velocities. Relativistic dynamics of a point particle. Mass, energy, and momentum in the theory of relativity.</p> <p>Basics of quantum physics. One-dimensional Schrödinger equation. Potential well. Expectation values of operators. Harmonic oscillator. Reflection and transmission of waves. Three-dimensional Schrödinger equation. Quantization of angular momentum. Hydrogen atom. Spin.</p>				
Student workload (hours)		Grading		
Lectures and Exercises	90	Assessment method	Points	
Exam preparation	85	Midterm exam	50	
Total	175	Final exam	50	
		Total	100	
Literature				
<ol style="list-style-type: none"> 1. Lecture notes 2. Paul A. Tipler, Ralph A. Llewellyn, <i>Modern physics</i>, W. H. Freeman and Company, New York, 2012 3. R. A. Serway, C. J. Moses, C. A. Moyer, <i>Modern Physics</i>, Thomson Learning, Belmont, 2005 4. D. Halliday, R. Resnick, <i>Modern Physics</i>, Wiley, Hoboken, NJ, 2010. 				
Remarks				