

Study program	Level of studies		Second cycle	
	Study program name		Physics Education	
Course name	SELECTED TOPICS IN MODERN PHYSICS III			
Course ID	Semester	Course status	ECTS credits	L+E
PTH9642	III	MANDATORY	6	3+2
Lecturer				
Aims and expected learning outcomes	<p>The aim of this course is to give the students of educational physics more detailed knowledge of the selected parts of contemporary theoretical physics. After the successful completion of the course student:</p> <p>Knows the basics of the dynamics of nonlinear systems; Knows the principles of the accelerator and particle detector; Knows the elements of the Standard model and modern theories beyond it; Knows the elements of the General Relativity and its results; Knows the basics of cosmology.</p>			
Course content				
<p>Nonlinear dynamics and chaos: Dynamics of dissipative systems, attractors. Bifurcations. Fractals and fractal dimensions. Stability of the atomic nucleus. Nuclear models. Accelerators and detectors. Elementary particles and fundamental interactions. Standard model - leptons and quarks, vector bosons. Space-time and internal symmetry, conservation laws, quantum numbers. Discrete symmetry, PCT theorem. Oscillations of neutrinos. Need for color, QCD. Spontaneous symmetry violation, Higgs boson. Physics beyond the Standard Model: Great unification, supersymmetry, string theory, quantum gravity. The influence of particle physics on the development of society and medicine. Cosmic rays. Getting information about the universe - optical, gamma, X, neutrinos astronomy. Classification of stars. Expansion of the universe, Hubble's constant. Basic solutions of Einstein field equations. Gravitational waves. Singularities, black holes, Big Bang theory. Thermodynamics of the early universe. Nucleosynthesis, the formation of structures in the universe. Inflation. Dark matter.</p>				
Student workload (hours)		Grading		
Lectures and Exercises	75	Assessment method	Points	
Exam preparation	75	Partial exams	60	
Total	150	Final exam	40	
		Total	100	
Literature				
<p>1. C. Grupen, Astroparticle Physics, Springer-Verlag 2005 2. Material from the web-site "e-nastava" Additional readings: 1. M. R. Belić, Deterministički kaos, Sveske fizičkih nauka, III (3), Beograd, 1990 2. D. T. Ferbel, Introduction to Nuclear and Particle Physics, Second Edition, World Scientific 2003 3. B. R. Martin, G. Show, Particle physics, John Wiley and sons, 1995</p>				
Remarks				
The student must win a minimum of 55% of the points on the partial exams to have the right to enter the final exam.				