

Study program	Level of studies		Third cycle	
	Title of the study program		Doctoral studies in physics	
Course title	MEDIUM ENERGY PARTICLE PHYSICS			
Course ID	Semester	Course status	ECTS credits	Teaching hours
PTH8041	I/II	Elective	10	30
Course aims and expected learning outcomes	<p>The aim of the course is to prepare students to take an active role in monitoring and quantifying the process of elastic and inelastic scattering of mesons and baryons at medium energies.</p> <p>Upon the completion of the course, student should be able to:</p> <ul style="list-style-type: none"> -analyse particle physics processes at medium energy. -explain connections and complementarities of elastic and inelastic -scattering proceses. -analyse analytic properties of invaraint amplitudes in physical and unphysical region. -apply methods for extracting resonance parameters. 			
COURSE CONTENT				
<p>Mandelstam's hypothesis. Pion-nucleon system. S and T matrix. Analytic properties of partial wave and scattering amplitudes. Relations between measurable quantities and scattering amplitudes. Expansion of scattering amplitudes in terms of partial waves. Partial wave dispersion relations.</p> <p>Methods of partial wave and amplitude analyses. Inelastic partial wave analysis – the continuum ambiguity. Invariant amplitudes in the unphysical region and near threshold. Analytic continuation of the invariant amplitudes in the unphysical region. Polarisation phenomena for meson production. The interactions between mesons and nucleons. Kinematics of two-body and three-body interactions. Phase shifts.</p> <p>A methods for ectracting the resonance parameters.</p>				
LITERATURE			ASSESSMENT OF LEARNING	
<ol style="list-style-type: none"> 1. Joh. R. Taylor, <i>Scattering Theory: The Quantum Theory of Nonrelativistic Collisions</i>, Dover Publications, New York, 2006. 2. D. Martin, T.D. Spearman, <i>Elementary Particle Theory</i>, North-Holland , Amsterdam, 1970. 3. John R. Taylor, <i>Scattering Theory</i>, John Wiley & Sons, Inc., New York, 1972. 4. G. Hoehler, <i>Elastic and Charge Exchange Scattering of Elementary Particles</i>; Subvolume b: <i>Pion-Nucleon Scattering</i>, Part 2. Methods and results of Phenomenological Analysis. Landolot-Boernstein, Numerical Data and Functional Relationships in Science and Technology, Ed. H. Schopper, Springer-Verlag Berlin-Heidelberg-New York 1983. 5. B. H. Bransden, R. G. Moorhouse, <i>Pion-Nucleon Sistem</i>, Princeton University Press, Princeton 1973. 6. T. Ericson and W. Weise: <i>Pions and Nucleons</i>, Oxford Science Publications , 1988. 			Assessment Method	Points
			Homeworks	20
			Seminar paper	40
			Final exam	40
			Total	100
Remarks				