NAME OF THE COURSE	**Introduction to Quantum Physics**					
Code	PMP117	Year of study	III.			
Course teacher	L. Vranješ Markić	Credits (ECTS)	6			
Associate teachers	I. Weber	Type of instruction (number of hours)	L	S	E	F
			30		30	
Status of the course	COMPULSORY	Percentage of application of e-learning	10%			

COURSE DESCRIPTION	
Course objectives	To enable understanding of basic concepts in quantum mechanics and their application to simple problems and hydrogen atom.
Course enrolment requirements and entry competences required for the course	Learning outcomes in general physics, classical mechanics, mathematics I-IV.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	1. Understanding basic concepts and principles of quantum mechanics: Schrödinger equation, wave function and its interpretation, stationary and nonstationary states, time evolution and expectation. 2.Interprete and discuss physical phenomena from the aspect of the Heisenberg uncertainty relations; being able to determine, using commutators of operators if physical properties can be simultaneously measured 3. To acquire understanding of formalism and 'language' of quantum mechanics and their connection to linear algebra. 4.To understand the concept of angular momentum in quantum mechanics. 5. To be able to solve Schrödinger equation for simple one dimensional systems (e.g. square well, harmonic oscillator, potential barrier.) and using the solution to calculate relevant probabilities, expectation values and time evolution of the solution. 6. To give concise physical interpretation and arguments for the validity of mathematical solutions. 7. To be able to solve simple problems in two and three dimensions in different coordinate systems, by using e.g. method of separation of variables in Schrödinger equation and to understand concept of degeneracy. 8. To understand quantum-mechanical description of hydrogen atom and the connection to experiment.
Course content broken down in detail by weekly class schedule (syllabus)	1. Wave-particle duality. 2. Stern-Gerlach experiment. Analogy with polarisation of light 3. Mathematical tools of quantum mechanics; Hilbert spaces, wave functions and Dirac notation 4. Operators. Uncertainty relations. 5. Representation in discrete and continuous bases. 6. Postulates of quantum mechanics. 7. Measurement and observables. 8. Time evolution. Schrodinger equation. Stationary states. Time evolution of expectation values. Wave packets. 9. Symmetries and conservation laws 10. The Ehrenfest theorem. Connecting quantum to classical mechanics 11. General properties of Schrodinger equation in 1D. The infinite square well potential. 12. One dimensional problems with potential barriers. 13. Harmonic oscillator. 14. General formalism of angular momentum and matrix representation. Eingenstates of orbital angular momentum. 15. Problems in three dimensions. Hydrogen atom.

Format of instruction	☐ lectures ☐ seminars and workshops ☐ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☐ multimedia ☐ laboratory ☐ work with mentor ☐ (other)
Student responsibilities		

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Class attendance	1,5	Research		Practical training	
	Experimental work		Report		Self-study (Other)	4,5
	Essay		Seminar essay		(Other)	
	Tests		Oral exam		(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	Writte exams (or colloquia) and oral exam

	Title	Number of copies in the library	Availability via other media
Required literature (available in the library and via other media)	N. Zettili, „Quantum Mechanics: Concepts and applications“	4	
	R. Scherrer „Quantum mechanics: An Accessible Introduction“	4	
	Different web pages with solutions of problems		web
	Popular and research papers and presentations from the lectures		web/moodle

Optional literature (at the time of submission of study programme proposal)	1. R. L. Liboff, „Introductory Quantum Mechanics“ 2. Auletta, Genaro, Parisi, "QuantumMechanics" 3. D. J. Griffits, "Introductionto QuantumMechanics" 4. G.L. Squires: „Problems in quantum mechanics : with solutions„
Quality assurance methods that ensure the acquisition of exit competences	Statistics of students' results and students' evaluation via anonymous questionnaires at the end of the course. The survey is conducted according to the rules of the University of Split.
Other (as the proposer wishes to add)	