

Study programmes: PhD Studies - Astronomy and Astrophysics				
Course name: Quantum Field Theory				
Lecturers: Voja Radovanović				
Status: Optional				
ECTS: 9				
Attendance prerequisites: Quantum mechanics, Classical mechanics, Electrodynamics				
Course aims: Acquiring advanced knowledge in quantum theory of fields (field quantization, renormalization, regularization).				
Course outcome: At the end of the course, student has enough skills to start a research on topics such as supersymmetry, string theory, non-commutative field theories, etc.				
Course content:				
1. Canonical quantisation of free scalar, spinor and electromagnetic field. Wick's theorem. S-matrix. Processes in quantum electrodynamics.				
2. Functional formalism: the path integrals in phase-space and configuration-space in quantum mechanics, Green functions and generating functional. Functional formalism in scalar field theory: Free field. Phi-4 theory. Green functions and generating functional. Feynman rules. Effective action and vertex functions. Ефективно дејство и вертексне функције. Schwinger-Dyson equations. Functional formalism for fermion field.				
3. Radiative corrections: electron's vertex function. Anomalous magnetic moment; Pauli–Villars regularization. Spectral representation. Vacuum polarisation. Dimensional regularisation. Cut-off method.				
4. Renormalisation: degree of divergence. Renormalisation of phi-4 theory and quantum electrodynamics. Renormalisation group equations. Asymptotic freedom.				
Literature:				
1. M. Peskin, D Schroeder, <i>An Introduction to Quantum Field Theory</i> , Addison Wesley, 1995				
2. D. Bailin, A. Love, <i>Introduction to Gauge Field Theory</i> , Bristol, 1986				
3. M. Srednicki, <i>Quantum Field Theory</i> , CUP, 2007				
Exercises: V. . Radovanovic, <i>Problem Book in Quantum Field Theory</i> , Springer, Berlin, 2008				
Number of hours: 10	Lecures: 4	Tutorials: 6	Laboratory: -	Research: -
Teaching and learning methods: Ex cathedra, group work, student research				
Assessment (maximal 100 points)				
Course assignments	points	Final exam	points	
Lectures	10	Written exam	30	
Exercises / Tutorials	-	Oral exam	30	
Colloquia	30	Written-oral exam	-	
Essay / Project	-			