DESCRIPTION OF THE COURSE OF STUDY

Course code		
Name of the course in	Polish	**Relatywistyczna mechanika kwantowa**
	English	**Relativistic quantum mechanics**

1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

1.1. Field of study	physics
1.2. Mode of study	Full-time
1.3. Level of study	2nd degree
1.4. Profile of study	General academic
1.5. Person/s preparing the course description	Prof. dr hab. Stanisław Mrówczyński
1.6. Contact	**stanislaw.mrowczynski@ncbj.gov.pl**

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Language of instruction	English
2.2. Prerequisites	knowledge of quantum mechanics

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes		lecture
3.2. Place of classes		Courses in the UJK teaching rooms of the Faculty of Exact and Natural Science
3.3. Form of assessment		Oral exam
3.4. Teaching methods		**lecture**
3.5. Bibliography	**Required reading**	St. Mrówczyński, ABC kwantowej teorii pola, Wydawnictwo UJK, Kielce, 2016
	Further reading	J.D. Bjorken i S.D. Drell, Relatywistyczna teoria kwantów, PWN, Warszawa, 1985

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

4.1. Course objectives (including form of classes)

Knowledge (lectures and laboratories)
C1. to acquaint students with the basic ideas of relativistic quantum theory
Abilities (laboratories and project)
C2. prepare students to independently study quantum field theory.

4.2. Detailed syllabus (including form of classes)

Lectures:
1.Difficulties in „relativization" of quantum mechanics
2.Canonical quantization applied to a harmonic oscillator
3.Scalar field – classical description and canonical quantization
4.Spinor field – classical description and canonical quantization
5.Electromagnetic field – classical description and canonical quantization
6.Relation of spin and statistics – problems with the hamiltonian na microcausality
7.Interacting fields and their temporal evolution
8.S matrix, cross section and amplitudes
9.The simplest collisional processes
10.Propagators
11.Feynman rules and simple collisional processes

4.3. Education outcomes in the discipline		
Code	**A student, who passed the course**	**Relation to learning outcomes**
within the scope of **KNOWLEDGE:**		
W01	has knowledge of the basic ideas of relativistic quantum theory	
within the scope of **ABILITIES:**		
U01	has skills to independently study quantum field theory	

4.4. Methods of assessment of the intended learning outcomes

Teaching outcomes *(code)*	**Method of assessment (+/-)**																				
	Oral answer			**Project**			**Self-study**			**Group work**			**Exam**								
	Form of classes			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***			***Form of classes***		
	L	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*	*L*	*C*	*P*
W01													***X***								
U01													***X***								
U02													***X***								

4.5. Criteria of assessment of the intended learning outcomes

Form of classes	**Grade**	**Criterion of assessment**
lecture (L)	**3**	at least 50% and not more than 60% of the total number of available points
	3,5	more than 60% and not more than 70% of the total number of available points
	4	more than 70% and not more than 80% of the total number of available points
	4,5	more than 80% and not more than 90% of the total number of available points
	5	more than 90% of the total number of available points

5. BALANCE OF ECTS CREDITS – STUDENT'S WORK INPUT

Category	**Student's workload**	
	Full-time studies	**Extramural studies**
NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/	***15***	
Participation in lectures	15	
Participation in laboratories/project		
Preparation for the exam		
Others		
INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/	***20***	
Preparation for the lecture	10	
Preparation for the laboratories		
Preparation for the exam	10	
Gathering materials for the project		
Preparation of multimedia presentation		
*Others**		
TOTAL NUMBER OF HOURS	**35**	
ECTS credits for the course of study	**2**	

Accepted for execution *(date and signatures of the teachers running the course in the given academic year)*

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