Course Unit Descriptor

Study Programme: Physics

Course Unit Title: Fundamental Interactions

Course Unit Code: M18FI

Name of Lecturer(s): Associate Professor Jovana Nikolov

Type and Level of Studies: Master Academic Degree

Course Status (compulsory/elective): Compulsory

Semester (winter/summer): Summer

Language of instruction: English

Mode of course unit delivery (face-to-face/distance learning): Face-to-face

Number of ECTS Allocated: 8

Prerequisites: Particle Physics

Course Aims:

In this course students will gain additional knowledge to the basis of Particle Physics. Besides theoretical approach, this course includes also practical analysis of data from superior experiments devoted to the measurements of characteristics of fundamental interactions, experimental data from LHC experiments at CERN.

Learning Outcomes:

General Skills:

Students will have an insight into part of the analysis of huge amount of experimental results from superior particle physics experiments (LHC - CERN). From the other side, deeper understanding of the basic concepts of physics phenomena, theoretical calculations and comparison of theoretical predictions with experimental results.

Specific Competencies:

Obtaining theoretical and practical knowledge in the field of fundamental interactions. Through practical work, students will have an insight in parts of complicate analysis of experimental data from LHC experiments.

Syllabus:

Theory

Elementary particles and basic interactions. Space-time physics (Lorentz transformations, relativistic kinematics, Faynmann's diagrams and calculations). Quark model. Calibration symmetries and interactions. Standard model and beyond standard model. Unification theories. Gravitation. Supersimetry. Strings. Experiments with fundamental interactions testing (CERN, LHC experiments).

Practice

Data analysis from complex experimental set-up (LHC experiments) and term papers.

Required Reading:

1. Nuclear and Particle Physics, Niels Walet, UMIST, Manchester, U.K. (2003)
2. Dynamics of the Standard Model, J.F. Donogue, E. Golowich, B. L. Holstein.
3. LHC Physics, T. Binoth, C. Buttar, P. J. Clark, E.W.N. Glover, CRC Press (2012).

Weekly Contact Hours:	**Lectures:** 3	**Practical work:** 3

Teaching Methods:

Lectures, seminars and practical work.

Knowledge Assessment (maximum of 100 points):

Pre-exam obligations	points	**Final exam**	points
Active class participation	5	written exam	20
Practical work	-	oral exam	50
Preliminary exam(s)	-	…….	
Seminar(s)	25		
The methods of knowledge assessment may differ; the table presents only some of the options: written exam, oral exam, project presentation, seminars, etc.			