COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	APE717	**SEMESTER**	7ο
COURSE TITLE	ELEMENTARY PARTICLES		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/ (The course does not exist in eclass)

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

This course equips students with the fundamental knowledge and skills required to describe subatomic phenomena within the framework of relativistic quantum mechanics. Emphasis is placed on the structure of hadrons as explained by the Standard Model of quarks. Upon successful completion, students will be able to apply relativistic methods to quantum phenomena and analyze the role of symmetries. The course covers the dynamics and symmetries underlying the Electroweak and Strong interactions, bridging theoretical predictions with experimental discoveries. It provides the essential background for understanding ongoing developments and current experiments in the field of Particle Physics.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Application of knowledge in practice

- Search, analysis, and synthesis of data and information
- Independent work
- Teamwork
- Work in an international environment
- Work in an interdisciplinary environment
- Generation of new research ideas
- Promotion of free, creative, and inductive thinking

3. COURSE CONTENT

Classification of elementary particles, relativistic kinematics, Mandelstam variables, resonances and invariant mass, symmetries and conservation laws, cross sections, Fermi's Golden Rule and Feynman diagrams, electromagnetic interactions (electron–electron scattering, Quantum Electrodynamics), weak interactions, deep inelastic scattering, proton structure functions, neutrinos, strong interactions, unification of Electroweak interactions (Standard Model), discovery of the Higgs boson at the LHC, and the search for New Physics with emphasis on recent developments.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course*	Optional short assignments (10%). Final written examination (90%–100%), consisting of problem solving from different sections of the course (use of notes is not permitted).

Activity	*Workload/semester*
Lectures	92
Self study	30
Exams	3
Course total (25 hours / ECTS)	**125**

assessment and how students are informed	

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- *Concepts of Elementary Particle Physics*, Michael E. Peskin
- *Particle Physics*, B.R. Martin & G. Shaw (edited and translated into Greek by G. Tsipolitis)
- *Introduction to Elementary Particle Physics*, Alessandro Bettini