COURSE OUTLINE

(1) GENERAL

SCHOOL	NATURAL SCIENCES		
ACADEMIC UNIT	DEPT. OF PHYSICS		
LEVEL OF STUDIES	GRADUATE		
COURSE CODE	**M126**	**SEMESTER**	**2**
COURSE TITLE	QUANTUM FIELD THEORY		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
	4	7
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	SPECIALIZED BACKGROUND
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES
COURSE WEBSITE (URL)	http://ecourse.uoi.gr/course/view.php?id=110

(2) LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B*
- *Guidelines for writing Learning Outcomes*

The course provides advanced material in Quantum Field Theory necessary for modern High Energy Physics and Cosmology. It covers the fundamental principles and mathematical structure that govern quantum relativistic phenomena.

A student who has completed the course is expected to

1) Have a command of the basic principles of quantum relativistic phenomena and to be able to obtain quantitative results for the corresponding processes
2) Be able to carry out a thorough analysis of these phenomena based on the concept of quantum fields
3) Set up mathematically the corresponding problems and proceed to their solution through the fundamental field equations
4) To have developed a sense of the unity of physics at a fundamental level through the unifying concept of quantum fields

General Competences
Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim? *Search for, analysis and synthesis of data and information, with the use of the necessary technology* *Adapting to new situations* *Decision-making* *Working independently* *Team work* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas* *Project planning and management* *Respect for difference and multiculturalism* *Respect for the natural environment* *Showing social, professional and ethical responsibility and sensitivity to gender issues* *Criticism and self-criticism* *Production of free, creative and inductive thinking* *……* *Others…* *…….*
Analysis and Synthesis of data, Creative Thinking, Working Independently

(3) SYLLABUS

Lorentz and Poincare groups. Classical scalar and spinor fields. Symmetries and Noether Theorem. Energy-Momentum Tensor. Quantization of scalar fields. Feynman propagator. Dirac field quantization. Discrete transformations. Gauge fields. Quantum Electrodynamics. Reduction formula. Feynman diagrams. Wick's Theorem. Scattering matrix. Scattering amplitudes. Applications of QFT. Functional formalism. Path integrals. Higher order processes. Regularization and Renormalization. Yang-Mills quantization.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Modern Moodle software is in use for communication and assignment posting by teacher and/or students
TEACHING METHODS *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	see table below
STUDENT PERFORMANCE EVALUATION *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to*	Written Exam

Activity	***Semester workload***
Lectures	30
Problem Sessions	10
Study of Literature	55
Independent Study	42
Exams	3
Assignments	35
Total	175

students.	

(5) ATTACHED BIBLIOGRAPHY

M. Peskin and Schroeder " Introduction to Quantum Field Theory"

P. Ramond "Field Theory: a modern primer"

M.Srednicki "Quantum Field Theory"