COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	PHYSICS		
LEVEL OF STUDIES	GRADUATE		
COURSE CODE	**M141**	**SEMESTER**	**2**
COURSE TITLE	**NUCLEAR PHYSICS**		

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*	Special background/ Specialization of general knowledge
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=1220

(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 students with advanced level concepts related to phenomenological nuclear models and basic nuclear reaction mechanisms. Upon successful completion, the student should be able to

- **Explain the basic characteristics of nuclear spectra attributed to single particle behavior, such as nuclear spin, electric and magnetic moment.**
- **Explain the basic characteristics of nuclear spectra attributed to a collective rotational or vibrational behavior.**
- **Become familiar with the use of phenomenological models and the extraction of useful nuclear parameters, such as the nuclear moment of inertia and the nuclear level density parameter.**
- **Explain nuclear data related to basic nuclear reaction mechanisms, such as elastic, inelastic scattering, heavy-ion fusion and compound nucleus decay.**

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	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*……*
Production of new research ideas	*Others…*
	…….

- Search, analysis and synthesis of data and information with the use of appropriate technologies.
- Decision taking. Autonomous and team work.
- Interdisciplinary work. Development of new research ideas.
- Free, creative and inductive thinking.

(3) SYLLABUS

Nuclear models

- The Fermi gas model
- The independent particle model
- The collective model

Introduction to nuclear reactions

- General characteristics
- Two-body kinematics
- Conservation laws
- The cross section
- Quantum scattering
- Determination of the nuclear size with scattering experiments
- Electron scattering

Nuclear reaction models

- Elastic scattering
- The optical model of elastic scattering
- The compound nucleus
- Heavy-ion fusion reactions
- The statistical model of compound nucleus decay

(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*	**Use of ICT in teaching and communication with 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*	
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 students.*	Written exams for the evaluation of conclusive comprehension and problem solving capabilities.

Activity	***Semester workload***
Lectures	52
Tutorials	18
Bibliography study	55
Non-directed study	47
Exams	3
Course total	***175***

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Lecture notes (http://ecourse.uoi.gr/course/view.php?id=1220)
- W.N. Cottingham and D.A. Greenwood, « Εισαγωγή στην Πυρηνική Φυσική», Γ. ΔΑΡΔΑΝΟΣ Ο.Ε. (2002).
- G.R. Satchler, «Εισαγωγή στις Πυρηνικές Αντιδράσεις», Εκδόσεις Παπαζήση ΑΕΒΕ (1999).
- P.E. Hodgson, E. Gadioli, and E. Gadioli Erba, «Introduction to Nuclear Physics», Oxford University Press (1997).