COURSE OUTLINE

(1) GENERAL

SCHOOL	SCHOOL OF SCIENCES		
ACADEMIC UNIT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	**203**	**SEMESTER**	**7**
COURSE TITLE	INTRODUCTION TO 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	5
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
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (Greek & English)
COURSE WEBSITE (URL)	https://ecourse.uoi.gr/course/view.php?id=273

(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*

This course provides the student the ability to understand Nuclear Physics, specifically nuclear structure, nuclear decays, and nuclear energy production. After successfully completing this course, the student will be able to:

- Understand the basic properties of the nucleus such as nuclear mass, isotopic spin, electromagnetic moments, and characteristics of energy states.
- Understand nuclear stability, the origin of nuclear decays, and the laws governing them.
- Understand the peculiarity of alpha decay in terms of the potential barrier, solve the problem, and calculate the transmission coefficient and decay constant.
- Understand the energy spectrum of particles from beta decay, categorize transitions, and calculate the corresponding transition factor.
- Understand how the properties of gamma rays arise from the laws of Electrodynamics through the Electromagnetic operator and study the decay of nuclear states via gamma rays.
- Understand the shell model and apply it to simple problems of nuclear structure.
- Handle issues of environmental radioactivity, whether from natural or artificial sources.
- Understand the phenomenology of nuclear reactions and comprehend the production of energy from nuclear fission and fusion.

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…* *…….*

Search for, analysis and synthesis of data and information, with the use of the necessary technology, Working independently, Team work, Working in an interdisciplinary environment, Production of free, creative and inductive thinking

(3) SYLLABUS

Properties of nuclei (electric charge distribution, binding mass-energy, angular momentum, parity, isotopic spin, electromagnetic moments), Nuclear instability, Alpha, beta, gamma decay, Nuclear potential, Introduction to the nuclear shell model, Basic concepts of nuclear reactions

(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*	The course website is used to provide information, distribute notes and exercises, post announcements, and communicate 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 examinations at the end of the course, which assess theoretical knowledge and problem-solving ability.

Activity	***Semester workload***
Lectures	39
Tutorials	13
Study of bibliography	50
Self-directed study	20
Exams	3
Course total	***125***

(5) ATTACHED BIBLIOGRAPHY

- KRANE S. KENNETH, ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΠΥΡΗΝΙΚΗ ΦΥΣΙΚΗ, ISBN13: 9789600122473, GUTENBERG
- Glenn E Knoll, Radiation Detection and Measurement, John Wiley & Sons, Inc.