ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
Α .Δ Ι .Π .
ΑΡΧΗ ΔΙΑΣΦΑΛΙΣΗΣ & ΠΙΣΤΟΠΟΙΗΣΗΣ
ΤΗΣ ΠΟΙΟΤΗΤΑΣ ΣΤΗΝ ΑΝΩΤΑΤΗ
ΕΚΠΑΙΔΕΥΣΗ

HELLENIC REPUBLIC
H .Q .A .
HELLENIC QUALITY ASSURANCE
AND ACCREDITATION AGENCY

ΤΕΧΝΟΛΟΓΙΚΟ ΕΚΠΑΙΔΕΥΤΙΚΟ ΙΔΡΥΜΑ ΑΝΑΤΟΛΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ ΚΑΙ ΘΡΑΚΗΣ
ΜΟΝΑΔΑ ΔΙΑΣΦΑΛΙΣΗΣ ΤΗΣ ΠΟΙΟΤΗΤΑΣ ΤΕΙ ΑΜΘ

Quality Assurance in Higher Education
Course Data Collection Form

ΤΕΧΝΟΛΟΓΙΚΟ ΕΚΠΑΙΔΕΥΤΙΚΟ ΙΔΡΥΜΑ
ΑΝΑΤΟΛΙΚΗΣ ΜΑΚΕΔΟΝΙΑΣ & ΘΡΑΚΗΣ
ΑΓΙΟΣ ΛΟΥΚΑΣ,
65404 ΚΑΒΑΛΑ

EASTERN MACEDONIA AND THRACE
INSTITUTE OF TECHNOLOGY
AGIOS LOUKAS
65404 KAVALA

COURSE OUTLINE

(1) GENERAL

Name and surname of lecturer	Jacob Fantidis		
SCHOOL	of Technological Applications		
ACADEMIC UNIT	Department of Electrical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	ZN4	**SEMESTER**	**7th**
COURSE TITLE	Nuclear Technology		

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**
Lectures and Exercises	3 Th.	4
Laboratory	3	2
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*	Knowledge, Skills development
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	http://eclass.teikav.edu.gr/ED176/

(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 aim is to teach the students the basic concepts of nuclear technology and radiation protection. Also to understand the operation and safety of nuclear reactors for energy production and meet the radiation applications. Extensive information is provided in the biological effects of radiation. The courses are developed with intention to train engineers rather than physist.
The modules of the course includes: Introduction to Nuclear Physics - Radioactivity. Detection of Ionizing Radiation (Particle and Electromagnetic). Radiation Sources in the Natural Environment. Cross Section.. Description of the Neutron Life Cycle and their role in Nuclear Technology - Method of Monte Carlo. Nuclear Energy and Technology Reactor - Shielding. Power stations with the new-generation reactors. Causes of accidents, control and safety of reactors. Management of Nuclear Fuel. Doses and Radiation Protection. Applications of radiation in the science of engineering
The use of specialized simulation program (MCNP4A) helps in the calculation of more complex geometries and examples.
Upon successful completion of this course the student will be able to:

- Be familiar with the natural radioactive decay and interactions of radiation with matter.
- Be familiar with the reactions with neutrons, cross sections and reactions rates.
- Be familiar f with fission, fissionable materials and neutrons.
- Be familiar with the principles and instruments of detection and measurement of radiation
- Know the basic principles of radiation protection.
- Be able to calculate the necessary shield for the gamma radiation
- Evaluate basic design parameters for a nuclear reactor

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…*
	…….

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

(3) SYLLABUS

I. Introduction to the Nuclear Physics and Radioactivity.
II. Detection and measurement of radiation. Detection of Ionizing Radiation. Radiation Sources in the Natural Environment.

III.	Nuclear reactions and cross sections. Fission. Interaction of matter and radiation.
IV.	Description of the Neutron Life Cycle and their role in Nuclear Technology.
V.	V. Nuclear Technology and Reactor. Nuclear power plants. Criticality.
VI.	Nuclear Power stations with the new-generation reactors.
VII.	Causes of accidents, control and safety of reactors. Management of Nuclear Fuel.
VIII.	Doses and Radiation Protection. Applications of radiation in the science of engineering applications in industry and in the sciences. Pollution.
IX.	Biological effects of radiation. Dosimetry. Radiation Protection Regulations, problem of shielding.
X.	Method of Monte Carlo.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face (in the classroom)
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Use slides, website of the course with supporting and auxiliary material,
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.*	Theory I. Final written examination (100%) with multiple choice questions Laboratory I. Team work (60%) III. Presentation of the team work (40%).

Activity	***Semester workload***
Lectures	39
Team work	22
Laboratory practice	39
Independent study	50
Course total	150

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

1. Nuclear Technology, Tsagas Nikolaos, ΑΪΒΑΖΗ, Xanthi 1986.
2. Introduction to Nuclear Technology, Antonopoulos - Domis Michael, Ziti, Thessaloniki,
3. Nuclear Energy: Principles, Practices, and Prospects, David Bodansky, Springer, 2004.
4. Nuclear Engineering: Theory and Technology of Commercial Nuclear Power, Ronald Allen Knief, Hemisphere Publishing Corporation, 1992.