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	Lykourgos Magafas		
SCHOOL	of Technological Applications		
ACADEMIC UNIT	Department of Electrical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**BN4**	**SEMESTER**	**2nd**
COURSE TITLE	Materials 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	2 Th.	4,5
Laboratory	3 Lab.	
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 – English in the case of foreign students
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBSITE (URL)	http://eclass.teikav.edu.gr/claroline/document/document.php?openDir=%2F2014-2015

(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 is an introduction in the science and technology of these materials within the scope of Electrical Engineering.
The course aims to provide knowledge on the basic properties of materials and theories that may explain the well (Bohr model, Energy band theory) and the classification of materials based on chemical bonds and their correlation with electrical properties that they present.
Also, the course aims in introducing students to the concepts of the electrical behavior of the materials, the resistance-conductivity, resistivity (specific electrical conductivity) - resistance (conductivity), and to understand the temperature dependence of the conductivity of the metallic material, alloys as well as the metal selection criteria depending on the applications.
Additional objective of the course is to introduce students in semiconductor technology, their electrical and optical properties of the categories are displayed according to their type of conductivity (intrinsic - extrinsic, extrinsic p-type or n), the technological importance and limitations their use, as well as the properties and applications of optoelectronic materials.
Still, the aim of the course is to introduce students to the insulating (dielectric) materials, the behavior in static and alternating electric fields, their usage possibilities.
Also, the aim of the course is to introduce students to the phenomenon of superconductivity, which materials display the phenomenon, the restrictions on use of and the possibilities opened up with increasing temperature at which it could be observed.
Finally, the aim of the course is to introduce students to the concepts of reliability of electrical and electronic components.
Upon successful completion of this course the student will be able to:
• Understand the basic theories on the structure of materials, and may describe the types of materials depending on their chemical bonds.
• Understand the concepts of electrical resistance – conductance electrical conductivity.
• Be able to classify a material as conductor, semiconductor, insulator superconductor.
• Be able to appropriate provision will be made experimentally calculate the conductivity material.
• Be able to predict the electrical behavior of a material at a different temperature than the room temperature.
• Be able to choose a material for as a conductor or insulator and can evaluate how safe is to use.
• Be able to utilize the properties of materials for optoelectronic applications.
• Be able to manage issues relating to the reliability of electrical and electronic components

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 for, analysis and synthesis of data and information, with the use of the necessary technology
Decision-making
Working independently
Team work
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management

(3) SYLLABUS

I. Introduction to the structure of materials
a. Bohr Theory
b. Energy levels
c. Types of chemical bonds
d. Free electron model
e. Energy bands theory
f. Quantum theory

II. Conductive materials
a. Conductance - Resistance
b. The model of conductance in metals
c. Electrical Resistivity and Conductivity
d. Classification of materials based on the value of conductivity.
e. The dependence of resistivity on temperature
f. Conductivity in alloys
g. Selection criteria for conductive materials
h. Study of conductive behavior of typical materials (Cu, Ag, Au, Al, W)

III. Semiconductors and devices
a. Introduction
b. Electronic Structure of Semiconductors, energy band gap.
c. Intrinsic - Extrinsic semiconductors (p-type, n-type n, compensated)
d. Conductivity of semiconductors.
e. Semiconducting materials
f. Semiconductor devices and applications
g. Optical phenomena in semiconductors and semiconductor devices
h. Photovoltaic modules
i. LED Laser -Diodes
j. Optical fibers and applications

IV. Dielectric materials
a. Introduction to Dielectric (insulating) materials.
b. Dielectric constant of materials; Properties of dielectric materials.

c. Dielectric materials under static fields
d. Dielectric materials under alternating fields
e. Categories of dielectric materials based on polarization properties- Dielectric hysteresis.
f. Dielectric materials and new trends

V. Superconductive materials.
a. Superconductivity
b. Magnetic properties of superconductors
c. Applications of superconductors (superconducting cables, magnets, computers)
d. Interpretation of superconductivity phenomenon.

VI. Reliability of Electrical and Electronic components
a. Failures of components and systems
b. Types of failures
c. Modes of failures
d. Lifetime Curve of components
e. Mean time to first failure
f. Mean time between failures.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Face to face (in the classroom) and distance learning using asynchronous platform.
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, asynchronous platform.
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*	***Activity*** — ***Semester workload*** *Lectures* — 26 *Laboratory practice* — 39 Independent study — *47,5* Course total — ***112,5***
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.*	Theoretical Course Final written examination (100%), that combines theoretical questions with critical ones as well as problems covering all the sections of the course. Laboratory course I. Individual work (40%) II. Test with multiple choice questions during the lessons (20%). III. Final Exam with multiple choice questions covering all the course sections (40%).

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- I. Jones,"Materials Science for Electrical and Electronic Engineers", Oxford University Press,2001
- R.Zachariason," Electrical Materials",Cengage Learning; 2 edition ,2011.
- L.Solymar, D.Walsh, R.Syms."Electrical Properties of Materials",Oxford University Press,2014.
- R.Smith,"Electrical Component Reliability Handbook", exida.com LLC; 3rd Edition edition ,2012.
- R. Swingler,"Reliability Characterisation of Electrical and Electronic Systems",Woodhead Publishing, 2015.
- A. Hippel,"Dielectric Materials and Applications",Artech House,1995.
- C. Hamagushi,"Basic Semiconductor Physic", Springer Berlin Heidelberg New York ,2010.
- Y. Yu. Peter, M. Cardona, "Fundamental of Semiconductors", Springer Berlin Heidelberg New York, 2001.
- J.Pipreck, "Semiconductor Optoelectronic Devices",Academic Press,ISBN 0-12-557190-9,2003.
- M.Balkanski, R.F.Wallis, "Semiconductor Physics and Applications", Oxford University Press, 2000.
- M.Getzlaff, "Fundamentals of Magnetism", Springer Berlin Heidelberg New York , 2008.

O.Sergiyenko, Ed. " Optoelectronic Devices and Properties", InTech, 2011.