COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	9.007	**SEMESTER**	9th
COURSE TITLE	Materials and Devices for Storage and Energy Savings		

COURSEWORK BREAKDOWN	**TEACHING WEEKLY HOURS**	**ECTS Credits**
Theory (Lectures)	2	2
Tutorial/Exercises	1	1
Laboratory exercises	1	1
TOTAL	**4**	**4**

COURSE UNIT TYPE	General knowledge
PREREQUISITES	Electroctechnical Materials I and II (Recommended)
LANGUAGE OF INSTRUCTION/EXAMS	Greek
COURSE DELIVERED TO ERASMUS STUDENTS	No
WEB PAGE (URL)	https://eclass.hmu.gr/courses/ECE132/

(2) LEARNING OUTCOMES

Learning Outcomes

A) The **knowledge**, which the students will acquire upon successful completion of the course includes:
a) the introduction in energy management as an energy saving factor.
b) the energy management methods in building and industry.
c) the state-of-the-art technologies leading to energy storage and savings.
d) the innovative energy technologies (fuel cells, thermochemical utilization of biomass) and their evaluation methodologies.
e) the experimental measurements related with the absolute and relative errors, the separation of direct and indirect measurements, the correct assessment and handling of random and systematic errors in measurements and the correct presentation of results.

B) The **skills**, which the students will obtain upon successful completion of the course are:
a) an understanding of energy savings and storage management, with an emphasis on the right choice of materials and devices for rational energy management as well as cost reduction from oil imports and CO_2 emissions from cars.
b) the selection of parameters for the design of materials with improved properties.
c) the correlation of materials properties with their applications for the selection of the most suitable materials among a wide range of materials under investigation.
d) the completion of experimental measurements with reliability, which will be based on the knowledge of the properties and characteristics of the material under investigation.
e) the evaluation of an experimental result through the laws or physical constants estimating the possible experimental errors and methodology to achieve the optimum outcome.
f) the writing-up of an experimental report, which includes the following sections: Introduction, Methodology, Discussion, Conclusions, References.

C) The **abilities**, which the students will get upon the successful completion of the course are:
a) the design of new materials with improved properties.
b) the estimation of the appropriate methodology for the correlation of alloys, ceramics, polymeric and magnetic materials with their applications.

c) the beneficial collaboration with other members of a team in the writing-up of a report.
d) the ability to recognize *in-vivo* and correct or bypass errors or even modify certain steps throughout the process of implementation of an experimental task in order to reach the answer the safest and most unambiguous way.

General Skills

- Autonomous work
- Teamwork
- Search, analysis and synthesis of data and information, using the necessary technologies
- Decision making
- Promoting liberal, creative and inductive/deductive thinking
- Work in an interdisciplinary environment

(3) SYLLABUS

Introduction to Energy Saving and Storage.

Description of the Relevant Legislation.

Energy requirements in Buildings.

Materials and Devices for Energy Saving in Buildings (Monitor and Determine the Efficiency of Devices).

Materials and Devices for Energy Storage in Electric and Hybrid Cars (Monitor and Determine the Performance of Devices).

Laboratory exercises
The laboratory exercises will involve the development and evaluation of materials in terms of their specific capacity and response time to continuous intercalation/deintercalation scans of cations such as lithium, magnesium, aluminium and zinc.

(4) TEACHING METHODS - ASSESSMENT

MODE OF DELIVERY	In-Class Face-to-Face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	Use of ICTs in lecturing Use of ICTs for the communication with students via the e-class platform
TEACHING ORGANIZATION	

Method description/Activity	Semester Workload
Lectures	39
Project (journal/paper reading and theoretical study)	35
Tutorials	20
Laboratory exercises	26
Total Contact Hours	**120**

ASSESSMENT METHODS	All announcements for the course regulations and complementary reading material are permanently posted in the course web page. The course grade incorporates the following evaluation procedures: 1. Written examination (20 %) • Problem solving. • Short answer questions.

	2. Final written examination (60 %) 3. Laboratory report (20 %)

(5) RECOMMENDED BIBLIOGRAPHY

-Recommended Bibliography:

Electrochemical Power Sources, Batteries, Fuel Cells and Supercpacitors, V.S. Bagotsky, A.M. Smundin, Y.M. Volfkovich, Tziola, 2020 ***(in Greek)****.*

-Relevant Scientific Journals:

- *Journal of Materials Chemistry*
- *Chemistry of Materials*
- *Journal of Power Sources*
- *Advanced Materials*
- *Advanced Energy Materials*
- *ACS Energy Letters*
- *Journal of the American Chemical Society*