COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	7.016	**SEMESTER**	7th
COURSE TITLE	Advanced Electronic Devices		

COURSEWORK BREAKDOWN	**TEACHING WEEKLY HOURS**	**ECTS Credits**
Theory (Lectures)	4	3
Tutorial/Exercises	1	1
TOTAL	**5**	**4**

COURSE UNIT TYPE	Deeping/consolidation of specialty knowledge
PREREQUISITES	Electrotechnical Materials I, Electronics I
LANGUAGE OF INSTRUCTION/EXAMS	Greek
COURSE DELIVERED TO ERASMUS STUDENTS	Yes
WEB PAGE (URL)	https://eclass.hmu.gr/courses/ECE115/

(2) LEARNING OUTCOMES

Learning Outcomes

1. To understand the physical and electrical properties of organic semiconductors
2. To understand the mechanisms of current conduction through these materials
3. To understand the procedures and methodology of studying the structure and properties of organic materials and to be familiar with the modern fabrication methods used today in the design of flexible materials and devices.
4. To describe and analyze the operating principles of basic organic electronic devices: from triodes to photovoltaic cells & systems and to organic light emitting diodes (OLEDS) and Laser
5. To know and apply the appropriate characterization protocols for the electrical and optical characterization of the various electronic devices for the reliable evaluation of their performance
6. To be able to use bibliographic databases to find / evaluate the most useful articles in their field of work

General Skills

- Retrieve, analyse and synthesise data and information, with the use of necessary technologies
- Autonomous work
- Teamwork
- Search, analysis and synthesis of data and information, using the necessary technologies
- Decision making
- Promoting liberal, creative and inductive/deductive thinking

(3) SYLLABUS

Theory:

The aim of the course is to get acquainted with the printed electronic devices that are not based on inorganic semiconductors, such as silicon but on organic semiconductors, fabricated with printing technologies, which are currently a pioneering category of electronics with huge market potential in four main application areas: displays, photovoltaics, lighting and bio-electronic systems. To achieve this goal the structure is as follows:

A. Organic Semiconductors
- Conductive Conjugate Polymers and Small Organic Molecules.
- Electronic Structure and Electronic Properties.
- Correlation of chemical structure and optoelectronic properties.
- Techniques of Synthesis and Characterization of Organic Semiconductors

B. Organic optoelectronic devices
- Photovoltaic Devices (OPVs)
- Light Emitting Diodes (OLEDs)
- Organic Semiconductor Lasers
- Optical displays
- Colorimeter and cathode ray tube monitors
- Field Effect Transistor (OFETs)

C. Flexible electronic devices
- Printing techniques of electronic devices
- Flexible sensors
- Printed organic thin film transistors
- Flexible bio-electronic devices

D. Characterization Techniques of Semiconductor Devices
- Morphological Characterization (AFM)
- Structural Characterization (X-ray spectroscopy)
- Elemental Characterization (Absorption, Raman and FTIR)
- Electrical Characterization (Hall Characterization)

Laboratory

Fabrication and characterization of OPVs
- Deposition of organic electronic thin films s by spin coating
- Thermal deposition of metals
- Optical characterization of organic thin film electrons
- Fabrication of OPVs
- Performance analysis of OPVs (J / V-EQE-IQE)
- OPVs stability analysis

(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 ICT in Laboratory Teaching • Use of ICTs for the communication with students via the e-class platform
TEACHING ORGANIZATION	

Method description/Activity	Semester Workload
Lectures	48
Laboratory Work	24
Study of scientific articles	12
Project	12
Exams	24
Total Contact Hours	**120**

ASSESSMENT METHODS	**Assessment Language: Greek** 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: **Description** Written test; duration of 180 minutes (70%) Laboratory assessment (15%) and project assessment (15%) **Student Assessment methods** 1. Written Exam with Short Answer Questions (Summative) 2. Written Exam with Extended Answer Questions (Summative) 3. Written Assignment (Summative) 4. Oral Exams (Summative) 5. Written Exam with Problem Solving (Summative) 6. Laboratory Assignment (Summative)

(5) RECOMMENDED BIBLIOGRAPHY

Recommended Bibliography:

α/α	*Title*	*Author*	*Publisher*	*ISBN*	*Year*
1	*Applications of Organic and Printed Electronics*	*Eugenio Cantatore*	*Springer*	*978-1-4614-3160-2*	*2013*
2	*Organic Electronics II: More Materials and Applications*	Hagen Klauk	Wiley-VCH	*978352732647*	*2012*
3	*Organic Photovoltaics: Materials, Device Physics, and Manufacturing Technologies, 2nd Edition*	*Christoph Brabec, Ullrich Scherf, Vladimir Dyakonov*	*Wiley-VCH*	*978-3-527-65693-6*	*2014*