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	DN2	**SEMESTER**	**4th**
COURSE TITLE	Measurement Systems		

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.	5,5
Laboratory	2 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 to the way of receiving, evaluating and processing measurements as well as and the measuring systems used in industry and related with subject of electrical engineer.
The target of the course aims to provide knowledge to students on:
A)The measurement evaluation and processing so that they can distinguish between actual measurements and systematic errors, calculate a measurement repeatability and random event and assess data allowing the calculation of the maximum limits and possible limits of the measurements.
B) The implementation protocols for making measurements as procedures for the calibration of the sensors systems. Also, the acquisition of basic knowledge on the species and the operating principles of sensory systems, the linearization of the output characteristics and concepts granularity, reliability, sensitivity, sliding to a sensor selection criteria.
C) The basic sensory systems that needs the Electrical Engineer and concern the power and torque figures, flow and liquid level, temperature, lighting, analyzed all the sensory systems that measure each of the previous sizes.
D) The interfaces and compensation sensor (bridge Wheatstone, Kelvin Bridge, ADC converters and DAC) and ways to interconnect sensors with E / PC and the remote control..

Upon successful completion of this course the student / her will be able to:
• To have understood the basic techniques on processing and evaluation of measurements.
• Be familiar with the rules making the measurements.
• Be able to monitor that a sensor system is ready for use.
• Be able to select the appropriate sensor system on a measurement requirements.
• Be aware of the sensory systems that measure strength, liquid level, temperature and light.
• Be aware of analog conversion techniques to digital and vice versa
• Know the compensation techniques for sensor devices.
• Be able to implement the interconnection of the sensory systems with computer.

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
Production of free, creative and inductive thinking

(3) SYLLABUS

I. Experimental Measurements - Theory of Errors
a. Recording and presentation of measurements
b. Types of errors in the measurement of physical quantities
c. Measurement Error
d. Properties of random errors
e. Error Propagation
f. Instrumentation
g. Characteristics of experimental data

II.Sensors
a. Key parts of a measuring system
b. Sensors and transducers
c. Sensors classification
d. Sensors classification according to energy
e. Sensors Classification according to operation principle
f. Sensors Characterization
g. Static - Dynamic behavior of sensors

III. Force and Torque Sensors
a. Categories sensors Force
b. Piezoresistive sensors
c. Torque Sensors
d. Sensor Adjustment

IV. Pressure Measurement
a. Pressure measuring devices
b. Piezoelectric element
c. Adjust pressure transducer.

V. Measuring Flow and Liquid Level
a. Types of flow meters
b. Differential flow meters
c. Electromagnetic flow meters
d. Types of liquid level meters

VI. Temperature measurement
a. Expansion Thermometers.
b. Thermoelectric effect
c. Thermocouple - Types of thermocouples
d. Electrical resistance thermometers
e. Thermistors
f. Temperature semiconductor converters

VII. Light measurement
a. Optical Sensors
b. Photoconductive sensors
c. Photovoltaic modules

VIII. Interfaces and sensors hedging
a. Wheatstone Bridge

b. Kelvin Bridge
c. Sample and hold circuit
d. Converters ADC/DACs
e. Instrumentation amplifiers
f. Sensors compensation with linear methods
g. Sensors compensation with non-linear methods

IX. Data Connection devices with PCs and instruments communications
a. Data interface devices with PC.
b. Devises for external and internal connection
c. Sensors and Embedded systems devices
d. Programming Embedded Devices
e. Remote Control of Embedded devices via web

(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*	
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%).

Activity	*Semester workload*
Lectures	39
Laboratory practice	26
essay writing	27,5
Independent study	45
Course total	***137,5***

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

1. L.Magafas and S.Toumbektsis "Measurement Systems", Kavala 2012 (In Greeks).
2. J.P. Bentley, "Principles of Measurement Systems" 2005, Pearson Education Limited.
3. P.Petridis, "Methods and Measurement Systems " Thessaloniki 1986 (In Greeks).
4. T. Lang, "Electronique des Systems de Mesures" Paris, Milan 1992 .
5. U.A.Baksi and A.V.Baksi, "Measurements and Instrumentations" , Technical Publication Pune, 2009.
6. R.Malaric, "Instrumentation and Measurement in Electrical Engineering", Brown Walkers Press, Florida, USA, 2011.
7. A.Morris, R.Lagari, "Measurement and Instrumantation – Theory and Application ", Elsevier, 2011.