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	KONSTANTINOS KARAKOULIDIS		
SCHOOL	of Technological Applications		
ACADEMIC UNIT	Department of Electrical Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	D1	**SEMESTER**	4th
COURSE TITLE	Electrical Machines I		

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. + 2 Lab.	5.5
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*	*Specialised general Khowlwdge*
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek
IS THE COURSE OFFERED TO ERASMUS STUDENTS	No
COURSE WEBSITE (URL)	http://eclass.teikav.edu.gr/ED129/

(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*

Aim of this course is to understand the students the structure and operation of Synchronous three-phase machines and Asynchronous machines (Three-phase and Single-phase). The objective of the course is to acquire the necessary theoretical background and especially the familiarization with mathematical analysis principles for the study of variables, parameters, behaviour and control of these machines. The deepening in the different sections that will be presented will be achieved by solving selected exercises. The modules of the course relate to:
Synchronous Machines: Construction, operating principles, types of synchronous machines, Analysis of basic Synchronous Machine for the comprehension of creation of magnetic fields therein. Synchronous Three-phase Generators, mathematical analysis, equivalent circuit, variables, parameters, operation, behaviour, control and regulation, efficiency. Parallel operation, stability. Synchronous Three-phase motors, mathematical analysis, equivalent circuit, variables, parameters, operation, behaviour, control, starting, braking, efficiency.
Asynchronous Machines: Construction, operating principles, types of asynchronous machines. Analysis of elementary asynchronous machine for understanding the generation of magnetic fields therein. Asynchronous (Induction) Three-phase motors, structure and types. Mathematical analysis, equivalent circuit, variables, parameters, operation, stability, behaviour, control, starting, braking, efficiency. Asynchronous Three-phase Generator, control, specific reference to utilization.
Single-phase motors: Single-phase induction motor. Construction, operating principles, applications. Starting of Single-phase Induction Motor.
Laboratory Exercises of Synchronous and Asynchronous Machines.
Upon successful completion of this course the student will be able to:

- Understand the operation of Synchronous and Asynchronous Machines.
- Understand the construction parts of Synchronous and Asynchronous Machines.
- Be able to analyze the operation of Synchronous and Asynchronous Machines through the respective equivalent circuits.
- Understand the basic design elements of Synchronous and Asynchronous Machines.
- Be able to determinate experimentally the parameters of equivalent circuits of Synchronous and Asynchronous Machines.
- To carry out tests and measurements in laboratory applications.

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
Adapting to new situations
Decision-making
Working independently
Team work
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment
Showing social, professional and ethical responsibility and sensitivity to gender issues
Criticism and self-criticism
Production of free, creative and inductive thinking
……
Others…
…….

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology*
- *Adapting to new situations*

- *Decision-making*
- *Working independently*
- *Working in an international environment*
- *Production of new research ideas*

(3) SYLLABUS

I. A Simple Loop in a Uniform Magnetic Field - The Rotating Magnetic Field - Magnetomotive Force and Flux Distribution on AC Machines - Induced Voltage in AC Machines.
II. Induced Torque in an AC Machine - Winding Insulation in an AC Machine - AC Machine Power Flows and Losses - Voltage Regulation and Speed Regulation.
III. Synchronous Generator Construction - The Speed of Rotation of a Synchronous Generator - The Internal Generated Voltage of a Synchronous Generator - The Equivalent Circuit of a Synchronous Generator.
IV. The Phasor Diagram of a Synchronous Generator - Power and Torque in Synchronous Generators - Measuring Synchronous Generator Model Parameters.
V. The Synchronous Generator Operating Alone - Parallel Operation of AC Generators - Synchronous Generator Transients - Synchronous Generator Ratings.
VI. Basic Principles of Motor Operations - Steady-State Synchronous Motor Operation - Starting Synchronous Motors - Synchronous Generators and Synchronous Motors - Synchronous Motor Ratings.
VII. Induction Motor Construction - Basic Induction Motor Concepts - The Equivalent Circuit of an Induction Motor.
VIII. Power and Torque in Induction Motors - Induction Motor Torque-Speed Characteristics - Variations in Induction Motor Torque-Speed Characteristics.
IX. Trends in Induction Motor Design - Starting Induction Motors - Speed Control of Induction Motors - Solid-State Induction Motor Drives.
X. Determining Circuit Model Parameters.
XI. The Induction Generator - Induction Motor Ratings.
XII. The Universal Motor - Introduction to Single-Phase Induction Motors.
XIII. Starting Single-Phase Induction Motors - Speed Control of Single-Phase Induction Motors - The Circuit Model of a Single-Phase Induction Motor - Other Types of Motors.

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<tr><td>DELIVERY
Face-to-face, Distance learning, etc.</td><td>Face to face (in the classroom)</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
Use of ICT in teaching, laboratory education, communication with students</td><td>Presentation with the help of slides (Theory and Laboratory), Website of the course with supporting and auxiliary material. Simulation Software. Contact with e-mail.</td></tr>
<tr><td>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</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>39</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Laboratory practice</td><td>39</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Independent study</td><td>59.5</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Course total</td><td>137.5</td></tr>
</table>
</td></tr>
<tr><td>STUDENT PERFORMANCE EVALUATION
Description of the evaluation procedure</td><td><u>Theoretical Course</u>
Final written examination (100%) which includes problems</td></tr>
</table>

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.*	solving from different sections of the course. Laboratory Course I. Individual work (40%) II. Final Exam (60%) with development questions throughout the courses.

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- C. I. Hubert, “Electrical Machines”, ION, 2008.
- S. J. Chapman, “Electrical Machines AC-DC”, TZIOLAS, 2009.
- P. Malatestas, "ELECTRICAL MACHINES", TZIOLAS, 2011.
- S. Umans, “Fitzgerald and Kingsley's Electric Machinery”, 7th Edition, McGraw-Hill Education - Europe, 2013.
- I. BOLDEA, L. TUTELEA, "Electric Machines", Taylor & Francis Inc, 2009.
- Gross, Charles Arthur, "Electric Machines", Taylor & Francis Inc, 2006.