EEE.8-1.5 ELECTRIC MACHINES II

COURSE OUTLINE

(1) GENERAL

SCHOOL	ENGINEERING SCHOOL			
ACADEMIC UNIT	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING			
LEVEL OF STUDIES	UNDERGRADUATE			
COURSE CODE	**EEE.8-1.5**	SEMESTER	8	
COURSE TITLE	ELECTRIC MACHINES II			
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			**4**	
Laboratory			**2**	
Total			**6**	**6**
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 Course			
PREREQUISITE COURSES:				
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek			
IS THE COURSE OFFERED TO ERASMUS STUDENTS	YES (in English for Erasmus Students)			
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/EEE261/			

(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*

Upon completion of the course, students will have acquired:

- Understanding and mastery of the basic concepts of the general laws of mechanics, fields, waves, electromagnetism, and their application towards solving engineering problems.
- Knowledge and use of the principles of circuit theory and electrical machines.
- Ability to calculate and design electrical machines.
- Knowledge of machine control and electrical drives, and their applications.

More specifically students will:

- Be able to understand the operation of electrical machines.
- Be able to select the appropriate types of electric machines based on their characteristics and the specific application requirements.
- Acquire knowledge of the operating and safety testing of electric machines
- Be able to understand the mathematical models and circuit models and how to determine corresponding parameters.
- Be able to select the applications and how the machines are used.

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…
…….

The course aims at fostering the following capabilities:

- Search for, analysis and synthesis of data and information, with the use of the necessary technology
- Independent work
- Production of free, creative and inductive thinking

(3) SYLLABUS

- Key parts of AC electrical machines, Categories of AC rotating machines, Windings of electrical machines. Operation in all four quadrants. Rotating magnetic field. Development of tension and torque.
- Asynchronous three-phase motor. Operating Principle. Equivalent single-phase circuit. Flow of power and degree of Performance
- Asynchronous three-phase motor. State equations. Torque-speed curve. Simplified Formula of Kloss. Maximum output power.
- Asynchronous three-phase motor. Identifying parameters of the equivalent circuit. Separation of mechanical losses and core losses.
- Asynchronous three-phase motor. Normalized curves. Effect of varying the voltage power to the torque-speed curve.

- Asynchronous three-phase motor. Effect of Varying frequency to the torque- speed curve. Time of acceleration. Asynchronous three-phase double cage motor.
- Asynchronous three-phase motor. Start Methods. Methods of braking asynchronous three-phase motors. Operation of three-phase motor as a single phase one.
- Asynchronous single-phase motor. Theory of two rotating fields. Equivalent circuit. Torque - Power. Calculation of equivalent circuit constants
- Asynchronous single-phase motor. Start Methods of single phase motors. Shaded pole motors.
- Synchronous generator construction. The equivalent circuit of a Synchronous generator. Power and Torque in Synchronous generator. Measuring Synchronous generator model parameters. Parallel operation of AC generators.
- Synchronous motor. Basic principles of motor operation. Steady-state Synchronous motor operation. Starting Synchronous motors.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY *Face-to-face, Distance learning, etc.*	Lectures and exercises, face-to-face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY *Use of ICT in teaching, laboratory education, communication with students*	Teaching using ICT, Laboratory Education using ICT, Communication and Electronic Submission
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.*	Language of Evaluation: Greek and English for students Erasmus. <u>Final Written Exams: 100%</u>

Activity	*Semester workload*
Lectures	52
Laboratory Exercises	26
Preparation for Writing laboratory reports- homework	13
Personal study	59
Course total	***150***

(5) ATTACHED BIBLIOGRAPHY

1. Fitzerald A., Kingsley C., Umans S. (1983). Electric Machinery. Mc Graw-Hill. 4th Edition.
2. Zorbas D. (1989). Electric Machine. West Publishing Company. 1st Edition.
3. Malatestas P. (2013). Electric Machines. Tziolas Publication. (In Greek)
4. Safakas A., (2007). Electric Machines - Volume A, Publications of University of Patras (in Greek)
5. Chapman S. , (2009). Electric Machines , Tziolas Publication Thessaloniki (in Greek),