

## EEE.7-1.2 Electric Machines I

### COURSE OUTLINE

#### (1) GENERAL

<b>SCHOOL</b>	ENGINEERING SCHOOL		
<b>ACADEMIC UNIT</b>	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING		
<b>LEVEL OF STUDIES</b>	UNDERGRADUATE		
<b>COURSE CODE</b>	<b>EEE.7-1.2</b>	<b>SEMESTER</b>	7
<b>COURSE TITLE</b>	Electric Machines I		
<b>INDEPENDENT TEACHING ACTIVITIES</b> <i>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</i>		<b>WEEKLY TEACHING HOURS</b>	<b>CREDITS</b>
Lectures		4	
Laboratory		2	
<b>Total</b>		6	6
<i>Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).</i>			
<b>COURSE TYPE</b> <i>general background, special background, specialised general knowledge, skills development</i>	Specialization Course		
<b>PREREQUISITE COURSES:</b>			
<b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>	Greek(official)		
<b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>	YES (in English for Erasmus Students)		
<b>COURSE WEBSITE (URL)</b>	<a href="https://eclass.uniwa.gr/courses/EEE259/">https://eclass.uniwa.gr/courses/EEE259/</a>		

## (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 be able to:

- Understand the basic concepts of magnetic circuits as applied to electric machines.
- Understand the basic operation of a transformer.
- Understand terminal markings and various single phase and three phase wiring schemes.
- Understand the electrical testing methods performed on transformers such as insulation resistance testing, excitation and power factor testing.
- Describe the critical parts of transformer specifications
- Describe various transformer types and different methods of construction, application, and their advantages and disadvantages
- Explain transformer protection fundamentals
- Understand three phase transformers and different types of three phase circuits and connections.
- Understand basic motors and generators.
- Describe the operation of DC machines
- Explain construction and operation principle of dc motors and dc generators
- Describe the working principle of a DC motor and a DC generator.
- Describe the operation of, and factors affecting output and direction of current flow in DC generators.
- Describe the operation of, and factors affecting output power, torque, speed and direction of rotation of DC motors.
- Describe the difference between motors and state the use of series wound, shunt wound and compound DC motors.
- Explain construction and operation principle of transformers
- Describe methods of speed control and direction of rotation

### 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

- Decision making
- Independent work
- Teamwork
- Work in an international environment

### (3) SYLLABUS

- Magnetic circuits
- Conversion Energy
- Ferromagnetic materials
- Fundamental principles for analysis of transformers and electrical machines
- Transformers
- Single - phase transformers
- Three - phase transformers
- Autotransformers
- Configuration of single phase and three phase power transformers
- Magnetic saturation and higher harmonic effects
- DC Electric Machines
- Types of DC machines excited
- Dynamic analysis of DC Machines

### (4) TEACHING and LEARNING METHODS - EVALUATION

<b>DELIVERY</b> <i>Face-to-face, Distance learning, etc.</i>	Lectures and exercises, face-to-face.	
<b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b> <i>Use of ICT in teaching, laboratory education, communication with students</i>	Teaching using ICT, Laboratory Education using ICT, Communication and Electronic Submission	
<b>TEACHING METHODS</b> <i>The manner and methods of teaching are described in detail.</i> <i>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.</i>  <i>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</i>	<b>Activity</b>	<b>Semester workload</b>
	Lectures	52
	Laboratory Exercises	26
	Preparation for Writing laboratory reports- homework	13
	Personal study	59
	<b>Course total</b>	<b>150</b>
<b>STUDENT PERFORMANCE EVALUATION</b> <i>Description of the evaluation procedure</i>  <i>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</i>  <i>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</i>	Language of Evaluation: Greek and English for students Erasmus.  <u>Final Written Exams: 100%</u>	

### (5) ATTACHED BIBLIOGRAPHY

1. Malatestas P., (2012). Electric Machines , Tziolas Publications, Thessaloniki (in Greek)
2. Safakas A., (2007). Electric Machines - Volume A, Publications of University of Patras (in Greek)
3. Chapman S. , (2009). Electric Machines , Tziolas Publication Thessaloniki (in Greek),

4. Fitzgerald A. E. , Kingsley C., Umans S., (2003). Electric machinery, McGraw-Hill,
5. Cathey J. J., (2001). , Electric machines, McGraw-Hill,
6. Hindmarsh J., (1995), Electrical machines and their applications, Elsevier