ELECTRICAL MACHINES II

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.8.002.0	**SEMESTER**	2nd
COURSE TITLE	Electrical Machines II		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	0	6
Total	**0**	**6**

COURSE TYPE general background, special background, specialised general knowledge, skills development	Special background / Core
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE143/

2. LEARNING OUTCOMES

Learning outcomes

The course "Electric Machines II" aims to give students the necessary knowledge on AC electric motors. More specifically, it refers to the structure, operation, special features and applications of different types of AC motors.

Upon successful conclusion of this course, the students will be able to:

1. describe and explain the structure, structural characteristics and basic design principles of AC machines,
2. to experimentally determine and numerically calculate the parameters of the equivalent circuit of each machine,
3. examine and analyze the operation of AC motors through the corresponding equivalent circuits,
4. identify and distinguish the different types and variants of AC motors,
5. to create and reconstruct corresponding wiring connections of AC motors in the laboratory,
6. compare the alternatives and suggest the appropriate AC motor for a given application.

General Competences

- Search, analysis and synthesis of data and information, using the necessary technologies
- Adaptation to new situations
- Autonomous work
- Teamwork
- Work in an interdisciplinary environment
- Production of new research ideas

3. SYLLABUS

Theoretical Lecture Units

• General: Creation of a rotating magnetic field.

• Synchronous machines: Structure, principle of operation, characteristics, types, excitation, equivalent circuits, vector equation - vector diagram, power flow diagram, losses and efficiency. Experimental determination of equivalent circuit parameters. Study of a synchronous machine for motor/generator operation. For generator operation: Autonomous operation - synchronization, behavior in changes of load and excitation current, specifications. For motor operation: Starting, behavior in changes of load and excitation current.

• Three phase asynchronous motors: Structure, structural characteristics, types (squirrel cage, wound rotor), principle of operation, concept of slip, equivalent circuit, vector equation - vector diagram, power flow diagram, losses and efficiency, torque-speed characteristic, changes on the characteristic.

• Single phase asynchronous motor: Structure and principle of operation, equivalent circuit, starting.

• Reference to special types of motors (Universal, Synchronous reluctance, Switched reluctance).

Laboratory Exercises

1. Study of synchronous AC machines.
2. Study of parallel operation of alternators and synchronous motor loading.
3. Starting of three-phase asynchronous motors, of squirrel cage and slip-ring type.
4. Study of power balance and loading of an asynchronous squirrel cage motor.
5. Study of single-phase asynchronous motor.

4. TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Project-based, Individual study
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	
TEACHING METHODS The manner and methods of teaching are described in detail.	
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure	a) Project evaluation, b) Oral exam on given syllabus

Activity	**Semester workload**
Lectures	0
Laboratory Exercises	20
Συγγραφή εργ. αναφορών	20
Independent study	80
Study and literature review	60
Course total	**180**

5. ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

• Stephen Chapman, 'AC-DC Electric Machines'

• Hubert I. Charles,'Electric Machines': Theory, Operation, Applications, Adjustment, and Control

- *Relevant scientific journals:*

• IEEE Transactions on Energy Conversion

• IEEE Transactions on Industry applications

• IET Electric Power Applications