COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering		
DEPARTMENT	Electrical and Computer Engineering		
LEVEL OF STUDY	Undergraduate		
COURSE UNIT CODE	8.002	**SEMESTER**	8th
COURSE TITLE	ELECTRICAL MACHINES II		

COURSEWORK BREAKDOWN	**TEACHING WEEKLY HOURS**	**ECTS Credits**
Theory (Lectures)	3	3.5
Tutorial/Exercises	1	1
Laboratory courses	2	1.5
TOTAL	**6**	**6**

COURSE UNIT TYPE	Specialized general knowledge/Skills development
PREREQUISITES	None
LANGUAGE OF INSTRUCTION/EXAMS	Greek
COURSE DELIVERED TO ERASMUS STUDENTS	Yes (in Greek)
WEB PAGE (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 Skills

- 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 METHODS - ASSESSMENT

<table>
<tr><td>MODE OF DELIVERY</td><td>Face-to-Face</td></tr>
<tr><td>USE OF INFORMATION AND COMMUNICATION TECHNOLOGY</td><td>▪ Use of ICTs in lecturing
▪ Use of ICTs in laboratory education
▪ Use of ICTs for the communication with students via the e-class platform</td></tr>
<tr><td>TEACHING ORGANIZATION</td><td>
<table>
<tr><th>Activity</th><th>Semester workload</th></tr>
<tr><td>Lectures</td><td>52</td></tr>
<tr><td>Laboratory exercises</td><td>26</td></tr>
<tr><td>Writing lab. reports</td><td>36</td></tr>
<tr><td>Independent study</td><td>40</td></tr>
<tr><td>Study and analysis bibliography</td><td>26</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Total Contact Hours</td><td>180</td></tr>
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<tr><td>ASSESSMENT METHODS</td><td>Evaluation language: Greek

ASSESSMENT METHODS:
1. Written examination (20%)
2. Final written examination (40%)
• Short answer questions
• Problem solving
3. Laboratory reports (20%)
4. Final oral examination on the laboratory bench (20%)

The evaluation criteria are announced to the students at the beginning of the semester and are posted on the course website in eClass.</td></tr>
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(5) RECOMMENDED BIBLIOGRAPHY

- Suggested bibliography:

- *Stephen Chapman, 'AC-DC Electric Machines', 5th edition, Tsiola Publications, Thessaloniki, 2019.*
- *Hubert I. Charles,'Electric Machines': Theory, Operation, Applications, Adjustment, and Control, Ion Publications, Athens, 2008.*
- *Malatestas Pantelis,'Electrical Machines', 3rd edition, Tziola Publications, Thessaloniki, 2015. (in Greek)*
- *Safakas Athanasios,' Electric Machines', 1st edition, Ziti Publications, Thessaloniki, 2019. (in Greek)*
- *Ioannis Xipteras, 'Electrical Machines' , DC Machines και asynchronous Machines, Volume*
- *I, II', Ziti Publications, Thessaloniki, 1993. (in Greek)*

- Relevant scientific journals:

- *IEEE Transactions on Energy Conversion*
- *IEEE Transactions on Industry applications*
- *IET Electric Power Applications*