ELECTRICAL DRIVE SYSTEMS

COURSE OUTLINE

1. GENERAL			
SCHOOL	School of Engineering		
ACADEMIC UNIT	Department of Electrical and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	0811.9.005.0	**SEMESTER**	1st
COURSE TITLE	Electrical Drive Systems		

INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course	**WEEKLY TEACHING HOURS**	**CREDITS**
	0	4
Total	**0**	**4**

COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialised general knowledge
PREREQUISITE COURSES	None
LANGUAGE OF INSTRUCTION and EXAMINATIONS	English
OFFERED TO ERASMUS STUDENTS	Yes (in English)
COURSE WEBSITE (URL)	https://eclass.hmu.gr/courses/ECE144/

2. LEARNING OUTCOMES

Learning outcomes

The course aims to give students basic knowledge on the structure and operation of Electric Motor Drive Systems, i.e. the control and power devices used to drive electric motors. The course presents the general principles of Electric Drive Systems and analyzes the specific characteristics of systems for driving DC and AC motors.
Upon successful conclusion of this course, the students should be able to:
1. identify and explain which electrical quantities and in what way they should be adjusted in order to apply the desired control on the driven motor - load,
2. describe and explain the structure, characteristics, capabilities and operation of the basic devices currently used to control DC and AC electric motors,
3. distinguish the differences and possibilities of the different control devices, as well as the requirements of the different types of mechanical load,
4. compose or propose the appropriate system for driving a given type of motor or load.

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

1. Structural elements and basic characteristics of electric motor drive systems. System structure, understanding of the effect of the load's torque-speed characteristic on the selection and stability of the system. Drive system selection criteria. Analysis of operation in the four quadrants.
2. Systems with DC motors: Methods of controlling the speed-torque of direct current motors. Starting, braking, speed control with field weakening. Analysis of the operation of power converters (semi / fully controlled rectifiers and choppers) for the control of DC motors.
3. Systems with AC motors (asynchronous): Speed-torque control methods for three-phase asynchronous squirrel cage and wound rotor motors. Effect of supply voltage and frequency, and rotor resistance. Starting, braking, speed control with constant V/f ratio. Speed ??control of slip ring motors with slip power recovery. Analysis of the operation of power converters for soft start (soft starters) and speed regulation (inverters) of three-phase asynchronous motors.

Laboratory Exercises

They include laboratory exercises and simulations using MATLAB-Simulink.

1. DC motor starting.
2. DC motor speed control.
3. Start and adjustment of speed and torque of separately excited DC 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
Study and report writing	20
Independent study	30
Study and literature review	50
Course total	**120**

5. ATTACHED BIBLIOGRAPHY

- Recommended bibliography:
• Krishnan R., "Electric Motor Systems: Modeling, Analysis and Control", 1st edition, Klidarithmos Publications, Athens, 2009.
• Mohan N., Undeland TM, Robbins W. P., "Introduction to Power Electronics", 3rd edition, Tziola Publications, Thessaloniki, 2010.
• Rashid M., "Power Electronics", 1st edition, Ion Publications, Athens, 2010.
- Relevant scientific journals:
• IEEE Transactions on Power Electronics
• IEEE Transactions on Industrial Electronics
• IEEE Transactions on Industry Applications