COURSE OUTLINE

(1) GENERAL

SCHOOL	Engineering			
DEPARTMENT	Electrical and Computer Engineering			
LEVEL OF STUDY	Undergraduate			
COURSE UNIT CODE	9.005	**SEMESTER OF STUDY**	9^{th}	
COURSE TITLE	Electric Motor Drive Systems			
	COURSEWORK BREAKDOWN		**TEACHING WEEKLY HOURS**	**ECTS Credits**
	Theory (Lectures)		2	2
	Tutorial/Project		1	1
	Laboratory		1	1
	TOTAL		**4**	**4**
COURSE UNIT TYPE	Deepening / Consolidation of specialty knowledge			
PREREQUISITES				
LANGUAGE OF INSTRUCTION/EXAMS	Greek			
COURSE DELIVERED TO ERASMUS STUDENTS	Yes (in Greek)			
WEB PAGE (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 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

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 with the DL-2308 system.

4. Speed adjustment with the WARD-LEONARD system.
5. Electric braking of DC motors.
6. DC motor control using adjustable DC chopper.
7. Start of three-phase induction motor, squirrel cage and slip-ring.
8. Study of setup for changing the frequency of the supply voltage.
9. Control of three-phase asynchronous motor with the help of a frequency converter.
10. Study of an induction generator.

(4) TEACHING METHODS - ASSESSMENT

MODE OF DELIVERY	In-Class Face-to-Face
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY	▪ Use of ICT in teaching ▪ Use of ICT in laboratory training ▪ Use of ICT in communicating with students through the electronic platform eClass
TEACHING ORGANISATION	

Method description / Activity	**Semester Workload**
Lectures	39
Laboratory	13
Laboratory study – reports	28
Independent study	30
Study and analysis of bibliography	10
Total Contact Hours	**120**

ASSESSMENT METHODS

Language of Assessment: Greek

Evaluation methods:
1. Written - oral midterm examination (20%)
2. Written final exam (40%)
   - with short answer questions
   - by problem solving
3. Laboratory exercises-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.

(5) RECOMMENDED BIBLIOGRAPHY

- Recommended bibliography:

- *Malatestas P., "Electric Motion", 4th edition, Tziola Publications, Thessaloniki, 2015.*
- *Krishnan R., "Electric Motor Systems: Modeling, Analysis and Control", 1st edition, Klidarithmos Publications, Athens, 2009.*

- *Ioannidou Maria G., "Control of Motion Systems", Symeon Publications, Athens, 2002.*
- *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.*
- *Kioskeridis I., "Power Electronics", 1st edition, Tziola Publications, Thessaloniki, 2008.*

- Relevant scientific journals:

- *IEEE Transactions on Power Electronics*
- *IEEE Transactions on Industrial Electronics*
- *IEEE Transactions on Industry Applications*