ELEC3101 COURSE CATALOG INFO

Course Code : ELEC3101				**Course Name :** Electromechanical Energy Conversion			
Semester	**Lecture (Le+T+L)**	**Local Credit**	**ECTS**	**Language**	**Category**	**Instructional Methods**	**Prerequisites**
6	(3+0+0)	3	5	English	Core	Lecture	ELEC2201 OR ELEC2205
Course Content	Magnetic circuits. Relation of current in a coil with the produced magnetic flux and magnetic flux density. Ideal transformers and practical transformers and their equivalent circuit parameters. Electromechanical energy conversion process. Mechanical force in the electromagnetic system. Electromagnetic conversion. DC machines, DC generators and DC motors. Asynchronous machines. Synchronous machines.						
Course Outcomes	**CO 1.** Recognize the applications of electromagnetics and understand the fundamental operation principles of electromechanical systems. **CO 2.** Apply the basic mathematical and engineering knowledge to electromagnetic and electromechanic problems. **CO 3.** Perform the analysis of basic electromagnetic and electromechanical systems. **CO 4.** Utilize measurement data to obtain the equivalent circuit models of transformers and rotating electric machines.						

COURSE PLAN	
W1	Introduction to the course. Basic laws of magnetism, properties of magnetic materials.
W2	Basic laws of magnetism, properties of magnetic materials. Analysis of magnetic circuits with/without airgaps and magnets.
W3	Analysis of magnetic circuits with/without airgaps and magnets. Single phase transformers, determination of equivalent circuit elements
W4	Phasor calculation of single phase transformers, voltage regulation
W5	Three phase transformers
W6	Energy Conservation, Energy Balance Equation, Coenergy, Field energy
W7	Voltage/Force induction. Force developed in linear electromechanical system, Torque developed in rotating electromechanical systems. Electromechanical Energy Conversion.
W8	DC Machines and their characteristic equations
W9	Control of DC Machines, Mid-term Exam
W10	Induction Machines and their characteristic equations
W11	Equivalent circuit parameters of a three phase induction machine
W12	Control of Induction Machines
W13	Synchronous Machines and their characteristic equations
W14	Control of Synchronous Machines

COURSE ASSESMENT AND ECTS WORK LOAD			
Type of Work	**Count**	**ECTS WORK LOAD**	
		Time (Hour)(Including prep. time)	**Work Load**
Attendance	14	3	42
Final Exam	1	20	20
Quizzes		10	10
Term project			
Reports			
Seminar			
Assignments			
Presentation			
Midterms		20	20
Project			
Laboratory			
Tutorial			
Other(Self study, Paper reviews)		30	30
		Total work load	122
		ECTS Credit (Load/25)	5

PROGRAM OUTCOMES - COURSE OUTCOMES RELATIONS		
PO	**Program Outcomes**	**CO**
1	**1.1.** Adequate knowledge in fundamentals of mathematics (algebra, differential equations, integrals, probability etc), science (physics, chemistry, biology etc.) and computer science (programming and simulation);	
	1.2. ability to use theoretical and applied knowledge in these areas in complex engineering problems.	1,2
2	**2.1.** Ability to identify, formulate, and solve complex engineering problems;	3,4
	2.2. ability to select and apply proper analysis and modeling methods for this purpose.	3,4
3	**3.1.** Ability to design and integrate components of a complex system or process, as they relate to Electrical and Electronics Engineering discipline, under realistic constraints and conditions, in such a way as to meet desired requirements;	

	3.2. ability to apply modern design methods.	
4	**4.1.** Ability to devise, select, and use techniques and tools needed for analyzing and solving complex problems encountered in engineering practice;	
	4.2. ability to employ information technologies effectively.	
5	**5.1.** Ability to design experiments,	
	5.2. ability to conduct experiments, gather, analyze and interpret data.	
6	**6.1.** Ability to work in intra-disciplinary teams;	
	6.2. ability to work in multi-disciplinary teams;	
	6.3. ability to take individual responsibilities.	
7	**7.1.** Ability to effectively communicate via written and oral means;	
	7.2. knowledge of at least one foreign language;	
	7.3. ability to write effective reports and comprehend written reports;	
	7.4. ability to write design and manufacturing reports	
	7.5. ability to present effectively,	
	7.6. ability to give and follow clear instructions.	
8	**8.1.** Recognition of the need for lifelong learning;	
	8.2. ability to access information, to follow developments in science and technology, and to continue to educate him/herself.	
9	**9.1.** Consciousness to behave according to ethical principles, and about professional and ethical responsibility;	
	9.2. knowledge on standards used in engineering practice.	
10	**10.1.** Knowledge about business life practices such as project management, risk management, and change management;	
	10.2. awareness in entrepreneurship, innovation;	
	10.3. knowledge about sustainable development.	
11	**11.1.** Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering;	
	11.2. awareness of the legal consequences of engineering solutions.	

Revison Date	Prepared by	Approved by
1.9.2019 1.6.2021	Prof. Dr. Yorgo Istefanopulos Prof. Dr. Ahmet Masum Hava	Prof.Dr. Ahmet Aksen

Main Text: S.J. Chapman, "*Electric Machinery Fundamentals*" (5th Ed.), McGraw Hill

Auxiliary Text: Fitzgeral, Kingsley & Umans, "*Electric Machinery*" (6th Ed.), McGraw Hill