Course unit title:	Electrical Machines with Laboratory		
Course unit code:	AEEE352		
Type of course unit:	Required		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	3		
Semester when the unit is delivered:	8 (Spring)		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr. Nicholas Christofides		
Learning outcomes of the course unit:	1. Examine and analyse magnetic circuits and air-gap effects 2. Examine and analyse the elements and operation of Power Transformers 3. Examine and analyse the elements and operation of D.C. motor and generator machines 4. Examine and analyse the elements and operation of A.C. motor and generator machines 5. Investigate in laboratory environment the characteristics of AC/DC machines and star/delta loads		
Mode of delivery:	Face-to-face		
Prerequisites:	AEEE312, AEEE350	Co-requisites:	AEEE351
Recommended optional program components:	None		
Course contents:	• **Magnetic circuits:** magnetic fields, magneto-motive force, magnetic flux density, magnetic flux, magnetic field strength, permeability, reluctance, magnetic circuit by analysis techniques, variation of B with H • **Transformer steady-state description, theory and analysis:** application of transformers, operation principle, equivalent model, analysis under load/no-load, voltage regulation, inductance, ideal transformer, transformer losses, EMF equation of a transformer, leakage flux, efficiency, open / short circuit tests, current transformers, auto transformers • **Asynchronous Machines - Induction Motors:** terminology, applications of IM, elements, of IM, rotor construction types, operation principles, synchronous speed, rotor speed, concept of slip, effect of number of poles, equivalent circuit, powers in IM, torque, starting of IM • **Synchronous Machines - Generators:** terminology, applications and elements of SM, rotor construction types, operation principles, synchronous speed, rotor speed, effect of number of poles, equivalent circuit, powers in SM, torque, voltage regulation, synchronous impedance, power angle • **DC Machines – DC Motor:** terminology, advantages/disadvantages, DC machines as generators and motors, applications and elements of DC machines, compound/series/shunt would rotor construction, operation principles, speed of motor, torque of motor, speed and torque characteristics, speed control, equivalent circuit,		
Recommended and/or required reading:	1. Hughes Electrical and Electronic Technology, 12e, Edward Hughes, John Hiley, et all, Pearson, 2016 2. Electrical Engineering Principles And Application, 6e, Hambley AR, Pearson, 2016		
Textbooks:	1. Electric Machinery Fundamentals, Stephen Chapman, McGraw Hill, 5e, 2011		

	2. Electrical Machines, Drives and Power Systems, Theodore Wildi, Pearson, 6e, 2013 3. Electric Machinery, E. Fitzgerald,Charles Kingsley, Jr.,Stephen Umans, McGraw Hill, 63, 2005
References:	1. Lucas-Nülle electrical machines training system laboratory manual
Planned learning activities and teaching methods:	Students are taught the course through lectures (3 hours per week) in classrooms via projector presentations and by the use of the whiteboard. Students also have 1 laboratory session (1 hour per week) where they have the opportunity to put into practise concepts and theory related to three phase loads, transformers and machines. Lectures are supplemented with laboratory work carried out on a transformer and machines training system, on three-phase loads and on a photovoltaic training system. During laboratory sessions, students examine and analyse the operation of 1-Φ/ 3-Φ transformers, 3-Φ induction and DC motors, 3-Φ loads connected in star/delta and, time permitting, photovoltaic systems. Following major lecture topics and chapters, mathematical problems and examples are solved during class. Exercises for assessed homework are also a standard practise for this course as well as at least one assignment. Lecture presentations are available for students to download via the university e-learning platform. Students are also advised to use the recommended course textbook or reference books for further reading and practice in solving related exercises. Further literature search is encouraged by assigning students to identify a specific problem related to some issue, gather relevant scientific information about how others have addressed the problem and report this information in written or orally. Students are assessed continuously and their knowledge is checked through tests with their assessment weight, date and time being set at the beginning of the semester via the course outline. Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing. Overall, the course assessment is both formative and summative and aims to comply with the subject's expected learning outcomes and the quality of the course.
Assessment methods and criteria:	• Laboratory 20% • Assignments/Homework 5% • Tests 15% • Final Exam 60%
Language of instruction:	English
Work placement(s):	No