EE456-3: Advanced Electrical Machines

Course code and name	EE456-3: Advanced Electrical Machines
Credits units	3 Credit units
Contact hours	5 Contact hours: 2 lecture, 1 tutorial and 2 practical
Instructor name	
Textbook	Stephen J. Chapman. Electric Machinery Fundamentals. McGraw Hill. Fourth edition. 2005.
Other supplemental materials	
	Specific course information
a. Course description	Direct and quadrature axis theory: general rotating field machine; transformation from 3 to 2 phases; transformation of the 2 phase rotor and stator to an arbitrary revolving coordinate system; voltage equations and balance of power and torque. Induction machines: steady-state operation, rapid acceleration, sudden load change, field oriented coordinate system, control of induction machines with injected currents, steady state operation using variable frequency and voltage converter, field oriented control using variable frequency and voltage converter. Synchronous machines: Steady state operations of salient-pole machines, determination of X_d and X_q, sudden short-circuit of the cylindrical-rotor machine, sudden short-circuit of salient pole machines, transient operation of salient-pole machines.
b. Prerequisite	EE354-3
c. Required / Elective	Elective
	Course Learning Outcomes
<u>CLO of the Lecture Activities:</u> CLO1: Apply fundamental electromagnetic theory to electrical machines and electro-magnetic devices. CLO2: Understand the fundamental design of electrical machines, in particular induction, permanent magnet and switched reluctance machines.	

CLO3: Be made aware of novel materials used in machines, such as high temperature superconductors.

CLO4: Gain knowledge of the different characteristics of machines for certain applications.

CLO of the Laboratory Activities:

CLO1: Verify theory and to improve knowledge learned in class.

CLO2: Formulate and solve problems related to theory.

CLO3: Design and safety conducts an experimental procedure.

CLO4: Independently perform accurate quantitative measurements, interpret experimental results, perform calculations on these results and draw a reasonable, accurate conclusion.

CLO5: Communicate critical analysis of scientific information through written reports.

CLO6: Be integrated inside a group of work and respect the team working.

Brief list of topics to be covered

- Maxwell's equations.

- Magnetic reluctance networks

- Finite element analysis

- Stator winding design.

- Squirrel cage rotor design.

- Permanent Magnet Machines.

- Switched Reluctance Machines

- Linear electrical machines.

- Superconducting machines

- D-Q analysis of transient behavior.

Mapping Course Learning Outcomes to Student Outcomes

	Lecture Activities						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7
CLO1							
CLO2							

CLO3							
CLO4							

	Laboratory Activities						
	SO1	SO2	SO3	SO4	SO5	SO6	SO7
CLO1							
CLO2							
CLO3							
CLO4							
CLO5							
CLO6							