Course unit title:	**Introduction to Electromagnetic Fields**		
Course unit code:	AEEE312		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	3rd		
Semester when the unit is delivered:	5th semester		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr. Symeon Nikolaou		
Learning outcomes of the course unit:	1. Examine the use of vector and scalar operators in Maxwell’s equations 2. Apply Gauss’ and Stokes’ theorems to calculate vector integrals. 3. Associate the use of boundary conditions between dielectric media with metal dielectric interface 4. Apply Gauss’ law to calculate E field from discrete and continuous charge distributions. 5. Analyze the capacitance from planar and cylindrical structures, calculate electrostatic forces and torques on charge distributions. 6. Explain the development of magnetic forces on current currying conductors using Biot-Savart’s law. 7. Calculate self and mutual inductance for coaxial cables and random shape circuits in the presence of magnetic fields. 8. Analyze the operation principles for AC generators and electric motors using time harmonic EM fields.		
Mode of delivery:	Face to face		
Prerequisites:	APHY112	Co-requisites:	
Recommended optional program components:	None		
Course contents:	• **Vector analysis:** Definition of Cartesian, cylindrical and spherical coordinates system. Vector calculations, use of gradient, divergence, rotation and laplacian operators. • **Electrostatics:** Gauss’ law, Coulomb’s law, integral and differential form of Maxwell’s equation for electrostatics. Derivation of Ohm’s law using Maxwell’s equations. Calculation of E field caused by discrete and continuous charge distribution. Calculation of capacitance for parallel plate and cylindrical capacitors. Comparison between boundary conditions between two dielectric media and between a metal and a dielectric. • **Magnetostatics:** Use of Ampere’s law, Biot – Savart’s law, calculation of inductance and self-inductance using the concept of magnetic flux. Magnetic boundary conditions, forces between current carrying conductors and moments on current currying loops in the presence of magnetic fields. • **Time harmonic electrodynamics:** Use of Maxwell’s time dependent equations for the operation explanation of AC voltage generator and of an electric motor. Forces and torques on loops or linear conductors in the presence of time-varying B field.		
Recommended and/or required reading:			

Textbooks:	Fawwaz T. Ulaby, “Fundamentals of Applied Electromagnetics, Prentice Hall, 2006.
References:	David K. Cheng, Field and Wave Electromagnetics, 2nd Edition, Addison-Wesley, 1989. W. H. Hayt, Jr. Engineering Electromagnetics, 6th Edition, McGraw-Hill, 2001
Planned learning activities and teaching methods:	The taught part of course is delivered to the students by means of lectures, conducted with the help of computer presentations. Lecture notes and presentations are available through the web for students to use in combination with the textbooks.
Assessment methods and criteria:	• Assignments: 20% • Tests: 30% • Final Exam: 50%
Language of instruction:	English
Work placement(s):	