UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
ECE-340	Electromagnetics I	6
Prerequisites	**Department**	**Semester**
MATH-270, MATH-330, PHYS-160	Engineering	Fall
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	Prof. Anastasis Polycarpou	3rd
Mode of Delivery	**Work Placement**	**Corequisites**
Face-to-Face	N/A	None

Course Objectives:

The main objectives of the course are to:

- Develop knowledge and understanding of vector algebra and vector calculus including coordinate systems and integration along lines, surfaces and volumes;
- Introduce the laws of electrostatics and boundary conditions across dielectric interfaces;
- Develop skills and techniques that can be used to calculate the voltage potential and electric field from a distribution of charges in either one of the three coordinate systems;
- Introduce Laplace's and Poisson's equations along with boundary conditions, and use of analytical and computational techniques for the solution of boundary value problems;
- Develop an understanding of the postulates and governing laws of magnetostatics and use of this knowledge to calculate the magnetic field from current distributions in either one of the three coordinate systems;
- Use the fundamentals of electrostatics and magnetostatics to calculate capacitance, resistance, and inductance of structures that conform to the Cartesian, Cylindrical, or Spherical coordinate system.

Learning Outcomes:

After completion of the course students are expected to be able to:

- Solve problems related to vector algebra, vector calculus, and orthogonal coordinate systems;
- Explain the relationship between electric charges and the induced electric field;

- Formulate a mathematical representation of the electric field in space due to a canonical distribution of charges;
- Explain the relationship between steady electric current and induced magnetic field;
- Formulate a mathematical representation of the magnetic field in an unbounded medium due to a steady electric current;
- Explain the effects of material parameters and discontinuities on the static electric and magnetic fields;
- Use basic principles, laws and mathematical techniques to solve electrostatic and magnetostatic problems.

Course Content:

- Electromagnetic concepts;
- Vector algebra and calculus including orthogonal coordinate systems, line/surface/volume integrals, gradient of a scalar field, divergence and curl of vector fields;
- Static electric fields including Coulomb's law, Gauss's law and applications, electric potential, electric dipole, conductors and dielectrics, boundary conditions, capacitance, energy and forces;
- Introduction of the Poisson's and Laplace's equations, method of images, and solutions of boundary value problems (BVPs);
- Steady electric currents including current density, Ohm's law, EMF, Kirchoff's voltage and current laws;
- Static magnetic fields including the fundamental postulates of magnetostatics, vector potential, Biot-Savart law, magnetic dipole, magnetic boundary conditions, inductance, magnetic energy, forces and torques.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises

Assessment Methods:

Homework, project, exams, final exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Fundamentals of Engineering Electromagnetics	David K. Cheng	Addison-Wesley	1993	0-201-56611-7

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Fundamentals of Applied Electromagnetics	F. T. Ulaby and U. Ravaioli	Pearson Education	2015	978-1-292-08244-8
Engineering Electromagnetics	W. H. Hayt and J. Buck	McGraw Hill	2011	978-0073380667