ELECTROMAGNETIC FIELDS I

Session 1: Introduction to Vector Algebra and Coordinate Systems – Introduction to the concept of the electric field through the use of the Coulomb force.

Session 2: Introduction to the concept of the Electric flux density in relation with the presence of static charge distributions– Application of the Gauss Law as an integral equation that quantifies the relation between electric charges and Electrostatic Fields –Differential form of the Gauss Law as the first equation of Maxwell.

Session 3: Introduction to the concept of energy and potential – Expending Energy for moving a point charge in the presence of an electrostatic field – Definition of Potential and Potential Difference in the presence of an Electrostatic Field – Electrostatic Field Energy.

Session 4: Fundamental properties of Conductors, Semiconductors and Dielectric Materials – Boundary Conditions at the interface of conductive or dielectric materials - The concept of Capacitance

Session 5: Introduction of Poisson and Laplace equations with the use of Gauss law - Solutions of the Poisson equation and Semiconductors.

Session 6: Introduction to the concept of the Magnetic field with the use of the Biot-Savart Law - Application of the Ampere Law as an integral equation that quantifies the relation between direct current and Steady Magnetic field - Differential form of the Ampere Law. Magnetic flux, Magnetic flux density and Gauss Law for the Magnetic field – Scalar and Vector Magnetic Potentials.

Session 7: Forces and Torques on current distributions and conductors – Properties of Magnetic Materials – Magnetic Boundary Conditions – Inductance