

Addis Ababa University

Addis Ababa Institute of Technology

School of Electrical and Computer Engineering

Electromagnetic Fields ECEG-2122

Instructor: Selamawit E. (Section: 2B & 2C)

ECTS Credits: 5

Course Objectives

- *Understand and quantify the electrical effects of static charge distributions in vacuum and material body.*
- *Apply the laws governing electrostatic to different charge distributions.*
- *Understand and quantify the effects of charges moving with uniform velocity.*
- *Understand the elements of electrodynamics.*
- *Summarize electromagnetism through Maxwell's equations.*

Course Contents

Chapter 1: Review of Vectors

Scalar & Vector Fields; Line, Surface, & Volume Integrals; Gradient of a Scalar field, Divergence & Curl of a Vector Field, the Divergence & Stokes's Theorems, Laplacian of a Scalar Field; Solenoidal & Irrotational Vector Fields, Helmholtz's Theorem; Orthogonal Curvilinear Coordinates.

Chapter 2: Electrostatic Fields

Coulomb's Law, Electric Field E , Electric Flux Density D ; Gauss's Law; Electric Potential V ; Relationship between E & V ; Electric Dipole; Energy in Electrostatic Fields.

Chapter 3: Electric Fields in Material Body

Convection & Conduction Currents; Polarization in Dielectrics; Boundary Conditions. Electrostatic Boundary-Value Problems Poisson's & Laplace's Equations; Resistance & Capacitance.

Chapter 4: Magnetostatics Fields

Biot-Savart Law; Ampere's Circuital Law; Magnetic Flux Density B ; Magnetic Vector Potential A ; Maxwell's Equation for Static EM Fields.

Chapter 5: Magnetic Forces & Materials

Forces due to Magnetic Fields; Magnetic Boundary Conditions; Magnetic Energy; Faraday's Law; Magnetic Forces & Materials

Chapter 6: Introduction to Time Varying EM Fields.

Teaching and Learning Methods

Lecture supported by tutorial, assignments, Demonstrations

Assessment/ Evaluation and Grading System

Continuous Assessment with Assignment, Tests and Projects (50%), Final examination (50%)

Attendance Requirements

75% Lecture Attendance

Textbook:

- *Matthew N. O. Sadiku, Elements of Electromagnetics, Oxford University Press, New York, 2001*

References:

- *Hayt, W.H., Engineering Electromagnetics, 4th ed., McGraw-Hill, 1981.*
- *David J. Griffiths, Introduction to Electrodynamics, 3rd ed., Prentice-Hall, Inc., 1999.*

Note:

- *To contact the Instructor: Write an email to engsela1@gmail.com with the tag [AAiT-EMF-2012] in the title.*