Department of Electrical Engineering,
School of Engineering,
University of Management and Technology

Course Outline

Course code……EE 310… Course title……Electromagnetics…Semester Fall 2014

Program	BSEE
Credit Hours	3
Duration	One semester
Prerequisites	NS124 Applied Physics
Resource Person (s)	Nauman Ahmed, Faran Awais Butt
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Date…….

Learning Objectives:

This course deals with the fundamental concepts of electromagnetic theory. The emphasis is made on physical understanding and practical applications in Electrical systems. It covers the study of Electric field concepts, Gauss's Law, Divergence, energy and potential, current in conductors, dielectrics, capacitance, Laplace and Poisson's equations, steady magnetic field and study of laws like Bio-Savart Law, ampere's circuital law, magnetic forces, materials and inductance, time varying fields and Maxwell's equations.

Student Learning Outcomes:

In accordance with HEC recommended outcomes a, b , c, d and e following are the expected outcomes for this course.

- Obtain a comprehensive understanding of fundamental concepts in static electric and magnetic fields.
- Know about fundamental laws of electromagnetic.
- Be familiar with different vector operators.
- Be able to apply Gauss's law, Ampere's law, Biot-Savart law, and Maxwell's equations in electromagnetic systems.
- Be familiar with four Maxwell's equations

1. Be able to apply electromagnetic boundary conditions to solve for fields at different mediums.

Learning Methodology:

Lecture, interactive, participative, EDA tools and Computer Simulations

Grade Evaluation Criteria

Following is the criteria for the distribution of marks to evaluate final grade in a semester

Marks Evaluation	Marks in percentage
Quizzes and Assignments	25
Mid Term	25
Final exam	50
Total	100

Recommended Text Books:

William H. Hayt and John A. Buck, *Engineering Electromagnetics* (8th edition), McGraw Hill, 2012.

Reference Book:

Fundamentals of Applied Electromagnetics, by F. T. Ulaby, E. Michielssen, and U. Ravaioli, 6th edition, 2010

Course Schedule

Lecture	Topics	Textbook /Reference Readings
1–4	Vector algebra, rectangular, cylindrical and spherical coordinate systems.	**1.1 – 1.9** Notes
3–5	Coulomb's law, electric field due to different charge distributions.	**2.1 – 2.6** - Class Notes
6-9	Electric flux density, Gauss's law and applications, Maxwell's first equation, vector operator and divergence	**3.1 – 3.7**
10-13	Energy expanded in moving a point charge, line integral, potential difference, potential field of a point charge and system of charges, potential gradient, dipole, energy density in electrostatic field	**4.1 – 4.8** **4.5 (Reference)**
14-15	Current density, continuity of current, metallic conductors, boundary conditions, method of images	**5.1 – 5.6**
Week 8	**Midterm**	**Midterm**
16-18	Dielectric materials, perfect dielectric materials and boundary conditions, capacitance and examples	**6.1 – 6.5, 6.7**
19-23	Biot-Savart law, Ampere's law, curl, Stoke's theorem, magnetic flux and flux density, scalar and vector magnetic potentials, derivation of steady magnetic field laws	**8.1 – 8.7** **Ch 5 (reference)**
24-27	Force on a moving charge, force on a differential current element, force between differential current elements, force and torque on a closed circuit, nature of magnetic materials and magnetic boundary conditions, magnetic	**9.1 – 9.10** **Ch 5 (reference)**

	circuits, inductance and mutual inductance	
28-30	Faraday's law, displacement current, maxwell's equations in point form and integral form, retarded potentials. Maxwell Equation for time varying fields	**10.1 – 10.4** **6.1-6.2 (reference)**