Faculty of Engineering & Technology

Electromagnetic Waves 1

Information :

Course Code :	COM 213	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Department of Electrical Engineering

Instructor Information :

Title	Name	Office hours
Lecturer	Mohamed Mokhtar Saad Fahim Hefny	4
Lecturer	Mohamed Mokhtar Saad Fahim Hefny	4
Assistant Lecturer	Ahmed Essam Fahim Zahran	5
Assistant Lecturer	Mostafa Mohamed Salaheldin Abdelkhalek	
Teaching Assistant	Mohamed Ibrahim Mohamed Ibrahim	

Area Of Study :

Upon successful completion of the course, the student should be able to:
1. understand the fundamentals of electromagnetic theory.
2. know the main elements used in electric circuits.
3. apply different techniques of solving electrostatic problems.
4. apply different techniques of solving electrostatic problems.
5. know the relation between electric and magnetic and their sources.
6. recognize the relation between electromagnetic theory and circuit theory.
7. Share ideas and work in a team or a group.

Description :

different coordinate systems used in solving vector field problems. Coulomb's law- relation of electric field intensity with different charges .the electric flux density- Gauss's law and the divergence theorem. relation between the electric field and the force exerted on charges, and energy expended in this motion- the potential gradient and dipole moment . the application of the previous laws to some materials; conductors- semiconductors- and dielectrics. Boundary conditions. Definition of susceptibility and permittivity. Laplace and Poisson equations in the three coordinate systems, examples of their solutions. relations of steady magnetic field, its curl, and Stoke's theorem. time-varying fields and Maxwell's equations

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Demonstrate knowledge and understanding of the fundamentals of electromagnetic theory.
2 -	Illustrate and describe solving techniques of electromagnetic problems.
3 -	Illustrate and describe theorems for solving electromagnetic problems.
b.Intellectual Skills: :	
1 -	Express ideas in structural and mathematic terms so that quantities evaluation is facilitated.
2 -	Ability to apply different alternative solutions.

3 -	Decide and choose among different solution alternatives.
4 -	Evaluate obtained results both individually or as a part of team.
c.Professional and Practical Skills: :	
1 -	Applying electromagnetic theorems on practical problems and situations.
d.General and Transferable Skills: :	
1 -	Write technical reports in accordance with standard scientific guidelines.
2 -	Work in a self-directed manner.
3 -	Analyze problems and use innovative thinking in their solution

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Vector analysis: Vector algebra ï Vector calculus ï Vector integral theorems ï Coordinate systems	10	6	4
Electrostatic fields in vacuum: Coulombôs law ï Electrostatic field ï Gaussôs law ï Potential ï Poissonôs and Laplaceôs equations ï Boundary conditions on conductors ï Electric dipole	10	6	4
Electrostatic fields in materials: Material polarization ï Displacement vector ï Boundary conditions ï Capacitance ï Electric energy	10	6	4
Stationary current field: Current flow ï Conservation of charge ï Kirchhofôs current law ï Ohmôs law ï Electrical resistance ï Boundary conditions ï Duality ï Jouleôs law	5	3	2
Stationary magnetic fields in vacuum: Ampereôs law of force ï Magnetic induction field ï Biot-Savart law ï magnetic vector potential ï Gaussôlaw for magnetic field ï Ampereôs circuital law ï Magnetic dipole	10	6	4
Stationary magnetic fields in materials: Magnetization ï Magnetic field intensity ï Boundary conditions ï Magnetic circuits	10	6	4
Quasi-stationary Electromagnetic fields: Faradayôs law of induction ï Induced electric field due to motion ï Inductance ï Magnetic energy	10	6	4
Time dependent electromagnetic fields: Maxwellôs equations ï Poynting theorem	5	3	2

Teaching And Learning Methodologies :

Lectures
Tutorials

Course Assessment :			
Methods of assessment	**Relative weight %**	**Week No**	**Assess What**
Attendance	10.00	14	
Final-term	40.00	15	to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving with different techniques studied
First Mid-Term Exam	15.00	7	to assess the skills of problem solving, understanding of related topics.
Quizzes and Assignments	10.00	14	to assess the ability of applying electromagnetic laws in solving and understanding of different technical issues.
Second Mid-Term Exam	15.00	11	to assess the skills of problem solving, understanding of related topics.

Course Notes :

No course notes are required

Recommended books :

1) F. T. Ulaby, ðFundamentals of Applied Electromagnetics,òPrentice-Hall, 1997
2) R. Plonsey and R. E. Collin, ñPrinciples and Applications of Electromagnetic Fields,òMcGraw-Hill, 1961.