BIRZEIT UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY
ECTRICAL AND COMPUTER ENGINEERING DEPARTMENT
Electromagnetics-1 - ENEE3408
By: Dr. Khaled Hejja

Textbook: Engineering electromagnetics / William H. Hayt, Jr., John A. Buck. — 8th ed

Intended Learning Outcomes (ILO's)

1. To understand the dynamics of electromagnetic fields through Maxwell's equations.

Therefore, the students need to understand:

2. the math modeling of fields and waves in different coordinate systems.
3. the laws of Electrostatic and Magnetostatic fields.
4. the electric and magnetic energy.

Grading System

Activity	Weight	Week	Date
Project-1	10%	W6	23rd/March
First Exam	20%	W6	25th/March
Project-2	10%	W11	27th/April
Second Exam	20%	W11	29th/April
Final Exam	40%		
	100%		

Course Contents:

Lecture Topic	Number of lectures	Week
Why Studying Electromagnetics and Introduction to Vector Analysis	2	w2
Coulomb's Law and Electric Field Intensity	2	w3
Electric Flux Density, Gauss's Law, and Divergence	2	w4
Energy and Potential	2	w5
First Exam and Project-1 Discussion	2	w6
Conductors and Dielectrics	2	w7
Capacitance	2	w8
The Steady Magnetic Field	2	w9
Magnetic Forces, Materials, and Inductance	2	w10
Second Exam and Project-2 Discussion	2	w11
Time-Varying Fields and Maxwell's Equations	2	w12
Applications of EM	1	w13
General Review	1	w14
Final Exam	1	?

PROJECT-1:

Instructions: (***Please pay careful attention to the instructions)

1. PREPARE A POWER POINT PRESENTATION ABOUT **ANY TWO TOPICS** YOU CHOSE FROM THE LIST.
2. THE LENGTH OF THE PRESENTATION MUST BE **3 (MINUTES MIN) TO 5 (MINUTES MAX)** (**OTHERWISE IT WILL BE REJECTED AND YOU GET ZERO MARK**)
3. THE PRESENTATION **MUST NOT EXCEED 10 SLIDES** (**MAXIMUM, OTHERWISE IT WILL BE REJECTED AND YOU GET ZERO MARK**).
4. **YOU MUST EXPLAIN THE PRESENTATION WITH YOUR OWN VOICE & VEDIO, RECORDED WITH THE PRESENTATION.**
5. **FINAL DELIVERY 18TH/MARCH OF WEEK-5.** (**MAXIMUM, OTHERWISE IT WILL BE REJECTED AND YOU GET ZERO MARK**).
6. **You need to go to the library, get books and research papers, you are free to use supporting videos, demonstrated experiments, ect.**

List of topics for Project-1:

1. Explain the Vector Operator ∇ and the Divergence Theorem, provide some applications.
2. Explain the Experimental Law of Coulomb, provide some applications.
3. Explain the Electric Field Intensity, provide some applications.
4. Explain the Electric Flux Density, provide some applications.
5. Explain Gauss's Law, provide some applications.
6. Explain Maxwell's First Equation, provide some applications.
7. What is Potential Difference and Potential, provide some applications.
8. Explain Potential Field of a Point Charge, provide some applications.
9. Explain The Potential Field of a System of Charges (Conservative Property), provide some applications.
10. Explain Potential Gradient, provide some applications.
11. Explain the Electric Dipole, provide some applications.
12. Explain Energy Density in the Electrostatic Field, provide some applications.

PROJECT-2:

Instructions: (***Please pay careful attention to the instructions)

1. PREPARE A POWER POINT PRESENTATION ABOUT **ANY TWO TOPICS** YOU CHOSE FROM THE LIST.
2. THE LENGTH OF THE PRESENTATION MUST BE **3 (MINUTES MIN) TO 5 (MINUTES MAX)** (**OTHERWISE IT WILL BE REJECTED AND YOU GET ZERO MARK**)
3. THE PRESENTATION **MUST NOT EXCEED 10 SLIDES** (**MAXIMUM, OTHERWISE IT WILL BE REJECTED AND YOU GET ZERO MARK**).
4. ***** YOU MUST EXPLAIN THE PRESENTATION WITH YOUR OWN VOICE & VEDIO, RECORDED WITH THE PRESENTATION.**
5. **FINAL DELIVERY 22nd/APRIL OF WEEK-10.** (**MAXIMUM, OTHERWISE IT WILL BE REJECTED AND YOU GET ZERO MARK**).
6. **You need to go to the library, get books and research papers, you are free to use supporting videos, demonstrated experiments, ect.**

List of topics for Project-2:

1. What is Current, Current Density, and Continuity of Current, provide some applications.
2. Explain the Conductor Properties and Boundary Conditions, provide some applications.
3. Explain the Method of Images, provide some applications.
4. Introduce the Semiconductors, provide some applications.
5. What is the Nature of Dielectric Materials, provide some applications.
6. Define the Capacitance, Parallel-Plate Capacitor, provide some applications.
7. Explain Poisson's and Laplace's Equations, provide some applications.
8. Explain Biot-Savart Law, Ampere's Circuital Law, provide some applications.
9. Explain the meaning of Curl, provide some applications.
10. Explain Stokes' Theorem, provide some applications.
11. Explain Magnetic Flux and Magnetic Flux Density, provide some applications.
12. Explain the Scalar and Vector Magnetic Potentials, provide some applications.
13. Explain the Force on a Moving Charge and Force on a Differential Current Element, provide some applications.
14. Explain the Force and Torque on a Closed Circuit, provide some applications.
15. Explain the Nature of Magnetic Materials, provide some applications.
16. Explain Magnetization and Permeability, provide some applications.
17. Explain Potential Energy and Forces on Magnetic Materials, provide some applications.
18. Explain Inductance and Mutual Inductance

EVALUATION CRITERIA FOR PROJECT-1 AND PROJECT-2:

	Excellent (2.5)	Very good (2)	Acceptable (1.5)	Poor (1)
Objectives clarity, Organization, Time management (2.5/10)	So clear objectives, Excellent overall organization, managed to sustain the interest of the audience all the time, and fully achieved the purpose of the presentation.	Clear objectives, well organized, kept the attention of the audience most of the time and achieved the purpose of the presentation	Clear objectives, acceptable organization, somehow enthusiastic and kept the audience attention for the most part. The purpose of the presentation was mainly achieved.	Poor objectives' clarity and poor organization, The presenter was not enthusiastic. The purpose of the presentation was not achieved
Content (2.5/10)	Used the best content that are directly related to the topic.	Used appropriate content sufficient to understand the topic.	Used appropriate content but not sufficient to understand the topic.	Not sufficient content.
Ratio of Text/Figures usage (2.5/10)	Exceptionally explained with figures and diagrams in addition to text.	Mostly explained with figures in addition to text.	Some figures	A few figures.
Delivery, voice clarity and volume (2.5/10)	The presenter is very well prepared and used creative tools. Voice and volume are clear all the time. Delivered the ideas in a clear manner without depending too much on the notes. Made eye contact.	Well prepared and delivered ideas with lots of eye contact. Voice and volume are clear most of the time	Somewhat prepared. Voice and volume are insufficiently clear. Delivery of the presentation was made but with strong dependence on notes and with hesitation. Some eye contact,	Weak voice and volume. The presenter was clearly not prepared and lacked eye contact.

References:

1. **Engineering electromagnetics / William H. Hayt, Jr., John A. Buck. 8th ed.**
2. **Nathan Ida - Engineering Electromagnetics-Springer, 4th ed.**
3. **Sadiku, Matthew N. O - Elements of electromagnetics-Oxford University Press, 7th ed.**