<table>
<tr><td rowspan="4"></td><td colspan="3">Course name: EE318 Electromagnetic Wave</td><td colspan="2">Department: Electrical and Electronics Engineering</td><td>Semester</td></tr>
<tr><td colspan="5"></td><td>6</td></tr>
<tr><td colspan="5">Methods of Education</td><td>Credit (ECTS)</td></tr>
<tr><td>Lecture</td><td>Study Time</td><td>Homework</td><td>Exam (incl. Preparation)</td><td>Total</td><td rowspan="2">5</td></tr>
<tr><td>39</td><td>40</td><td>36</td><td>35</td><td>150</td></tr>
<tr><td>Language</td><td colspan="6">English</td></tr>
<tr><td>Compulsory/Elective</td><td colspan="6">Compulsory</td></tr>
<tr><td>Prerequisites</td><td colspan="6">EE303</td></tr>
<tr><td>Course Contents</td><td colspan="6">Basics of magnetostatic fields, analysis of magnetostatic problems under different configuration and their applications.
Maxwell’s equations: time dependent wave equations, time harmonic waves, Phasor (complex) representation, and solutions of Maxwell’s equation. Plane wave propagation in different media, wave polarization, wave reflection and transmission under different configurations of boundary conditions.</td></tr>
<tr><td>Course Objective</td><td colspan="6">To teach the basics of static magnetic fields and their applications. And teach the Maxwell’s equations and the basics of plane wave characteristics and propagations in different media.</td></tr>
<tr><td>Learning Outcomes and Competences</td><td colspan="6">Students who pass the course will be able to:
– Identify the source of static magnetic current (steady state current) and analyze/calculate the magnetic force affecting a moving charge in a magnetic field
– Use Ampere’s law in solving different magnetostatic problems
– Use the vector magnetic potential in finding the magnetic field due to some current distribution
– Use Biot-Savart law in finding the magnetic field due to different current distribution
– Identify the magnetic moment and its application in analyzing magnetic field related problems
– Recognize different types of magnetic materials (Diamagnetic – paramagnetic – ferromagnetic – ferromagnetic – anti-ferromagnetic) and their interaction with magnetic field in finding the magnetic field
– Apply boundary conditions for the static magnetic fields under different problem configurations
– Analyze inductance (self and mutual) and inductor and recognize some of their applications
– Calculate the magnetic energy.
– Use of the virtual displacement method in calculating the magnetic force
– Analyze the effect of time varying source (electric current or charges) on the relationship between electric and magnetic fields as well as voltage and current
– Apply Faraday’s law and some of its applications (such as transformer)
– Derive the Maxwell’s equations and relate them scalar electric potential and vector magnetic potentials
– Use EM boundary conditions in problem solving
– Use the time harmonic fields in representing EM waves mathematically in different forms.
– Use the mathematical expression of uniform plane electromagnetic waves in recognizing their properties and characteristics.
– Analyze the doppler effect and it usage in determining the speed of a moving object
– Recognize the wave polarization (linear – circular – elliptical)
– Analyze the characteristics of plane wave propagation in; Lossy media, Ionized media, and conducting media.
– Understand the physics of EM power propagation and the usage of instantaneous Poynting vector and time-average Poynting vector</td></tr>
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	– Analyze the wave propagating from dielectric towards a conductor under different conditions (Normal incidence, Oblique incidence) under different polarization (Perpendicular polarization, Parallel polarization) – Learn the rules governing (Snell's law) the incident and reflected waves and use them in solving the problems of wave propagating between two different media		
Textbook and /or References	"Field and wave electromagnetics", 2nd edition, David. K. Cheng		
Assessment Criteria		If any, mark as (X)	Percentage (%)
	Midterm Exams	X	30
	Quizzes		
	Homework	X	20
	Projects		
	Term Paper		
	Laboratory work		
	Other		
	Final Exam	X	50
Instructors	Prof. Dr. Alaaeldeen Elrouby		

Weekly Schedule

Week	Subject
1	Introduction
2	Fundamentals of Magnetostatics
3	Vector Magnetic Potential
4	Magnetic Materials & Magnetic Circuits
5	Boundary Conditions, Inductance and Force
6	Time-Varying EM Waves & Maxwell's Equations (Part 1)
7	Time-Varying EM Waves & Maxwell's Equations (part 2)
8	Plane Electromagnetic Waves
9	**Mid-term Exam**
10	Applications of Magnetostatic fields and Electromagnetic waves
11	Plane Waves in Different Media
12	Plane Waves Propagation (part 1)
13	Plane Waves Propagation (part 2)
14	Plane Waves Propagation (part 3)
15	Review (if time permits)