

**EE340 Electromagnetics (112)**

**Section (01): Lecture Time SMW 10:00-10:50 AM. Lecture Location Room 59-2013**

**Section (04): Lecture Time SMW 11:00-11:50 AM. Lecture Location Room 59-2001**

Instructor	Dr. Husain A. Jamid	Office Location: Bldg. 59 Room 2088	Tel: 2141	<a href="mailto:hajamed@kfupm.edu.sa">hajamed@kfupm.edu.sa</a>	Office Hours: SMW 12:00-1:00 P.M.
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Course Information	Textbook Elements of Electromagnetics M. Sadiku, 5 <sup>th</sup> Edition	Grading					Attendance	
		Quizzes 12%	Project 3%	Two Exams 30%	Lab 20%	Final Exam 35%	6 unexcused absences → Warning 9 unexcused absences → DN	

Week	Event	Topics	Ch	Sec	HW
<b>1</b> Jan. 28-Feb. 01	Last day for adding courses Jan. 31	Vector Notation, Brief Review of Coordinate Systems, Electrostatics, Coulomb's Law	4	1-3	<b>HW1:</b> 4.3, 4.4, 4.5, 4.12, 4.14(a), 4.16
<b>2</b> Feb. 04-08	Last day for dropping courses without permanent record Feb. 08	Gauss' Law and its Applications, Electrostatic Potential.	4	4-8	<b>HW2:</b> 4.18, 4.22, 4.25, 4.27, 4.41, 4.43(a,d)
<b>3</b> Feb. 11-15		Electric Dipole, Electrostatic energy. Electrostatics in Materials: Currents.	4 5	9-10 1-4	<b>HW3:</b> 4.45, 4.49, 4.50, 5.4, 5.7
<b>4</b> Feb. 18-22		Electrostatic Boundary Conditions, Electrostatic Boundary-value Problems: Poisson's & LaPlace's Equations (1D).	5 6	5-9 1-2	<b>HW4:</b> 5.17, 5.23, 5.34(b,c), 6.1, 6.5
<b>5</b> Feb. 25-29		Resistance & Capacitance.	6	3-5	<b>HW5:</b> 6.9, 6.11, 6.18, 6.20, 6.22
<b>6</b> Mar. 03-07	Last day for dropping course(s) with "W" Mar. 07	Magnetostatics, Biot-Savart's, Ampere's Laws and Applications	7	1-4	<b>HW6:</b> 7.3, 7.6, 7.11, 7.14, 7.18, 7.20
<b>7</b> Mar. 10-14	<b>Exam 1:</b> Monday, Mar. 12 7:00 PM Location: 4-125	Magnetic Flux Density, Magnetic Potential, Magnetic Force, Magnetostatic Boundary Conditions	7 8	5-7 1, 2, 5, 7	<b>HW7:</b> 7.17, 7.25, 8.7, 8.9, 8.22, 8.28
<b>8</b> Mar. 17-21		Inductors and Inductance, Time-varying Fields, Faraday's Induction Law	8 9	8, 9 1-2	<b>HW8:</b> 8.29, 8.34, 8.38, 8.41
<b>Midterm Vacation 24-28 March, 2012</b>					
<b>9</b> Mar. 31-Apr. 04		Electromotive Force, Maxwell's Equations.	9	3-7	<b>HW9:</b> 9.1, 9.3, 9.5, 9.6, 9.8
<b>10</b> Apr. 07-11	Last day for withdrawal from <u>all</u> courses with "W" Apr. 11	Plane Electromagnetic Waves	10	1-3	<b>HW10:</b> 10.3, 10.12, 10.14, 10.17, 10.23
<b>11</b> Apr. 14-18		Plane Electromagnetic Waves (Continued)	10	3-6	<b>HW11:</b> 10.4, 10.5, 10.6, 10.31, 10.35
<b>12</b> Apr. 21-25	<b>Exam 2:</b> Monday, Apr. 23 7:00 PM Location: 4-125	Electromagnetic Power, Reflection of Plane Waves at Normal Incidence	10	7-8	<b>HW12:</b> 10.42, 10.50, 10.52(a,b,c), 10.53
<b>13</b> Apr. 28-May 02		Reflection of Plane Waves at Oblique Incidence, Introduction to Transmission Lines, Transmission Line Equations	10 11	9 1-3	<b>HW13:</b> 10.55, 10.56, 11.9, 11.17, 11.18, 11.19
<b>14</b> May 05-09	Last day for major exams and to withdraw from <u>all</u> courses with "WP/WF", May 09	Rectangular Waveguides	12	1-4	<b>HW14:</b> 12.1, 12.5, 12.6, 12.8, 12.9, 12.13
<b>15</b> May 12-16	Last day of classes Wednesday, May 16	Antennas, Hertzian Dipole, Review	13	1-2	<b>HW15:</b> 13.2, 13.4, 13.14, 13.26

Important Notes:

- 1) HW solution will be posted on the Web Ct.
- 2) Useful supplementary material can be found on the web link: <http://faculty.kfupm.edu.sa/ee/hajamed/>
- 3) There is a *possibility* of a quiz on each Wednesday. The quiz is related to the HW set assigned in the previous week. For instance, on Wednesday, Feb. 08, there is a possibility of a quiz based on HW1.
- 4) Only official excuses will be accepted by the instructor. An official excuse must be submitted to the instructor within 10 days of the date of the excuse.
- 5) You are not allowed to attend lectures, quizzes, or exams other than those of your own section.

**Course Number:** EE 340

**Course Title:** Electromagnetics (Required Course)

**Course Description :**

Electrostatics: Coulomb's law, Gauss's law, electric potential, electric dipoles, resistance, capacitance. Magnetostatics: Biot-Savart law, Ampere's law, Magnetic forces. Magnetic boundary conditions, inductance. Time varying fields: Faraday's Law, Maxwell's equations, Plane wave propagation. Reflection and refraction. Introduction to transmission line theory. Waveguides and Antennas.

**Prerequisites :**

EE 211-Electric Circuits I  
MATH302-Engineering Mathematics

**Textbook:**

Elements of Electromagnetics, M. Sadiku, 5th Edition, Saunders College, 2011.

**Other useful references and material :**

1. J. D. Kraus, "Electromagnetics", Third Edition, McGraw-Hill, New York, 1984.
2. David Cheng, *Field and Wave Electromagnetics*, Addison Wiley, 1989

**Objectives:**

- Introducing the concept of the electrostatic field and the potential difference due to static system of charges.
- Students learn the principals of the magnetic field due to electric current and other magnetic induction and potential relations.
- Teaching student the basic principals of designing circuit components such as resistance, capacitance and inductance.
- Students understand the fundamentals of the electromagnetic wave representation, their propagation in different media, their reflections/refractions, guidance and radiation.

**Topics:**

- Vector notation, Coulomb's law, Gauss's law, electrostatic potential (6 hours).
- Elec. dipole, current, polarization, continuity eq., energy density (3 hours).
- Boundary conditions, Poisson's & Laplace's equations. (3 hours).
- Resistance and capacitance, Biot-Savart's and Ampere's laws (4 hours).
- Magnetic flux density, magnetic vector potential (2 hours).
- Magnetic force and magnetization, magnetic boundary conditions (3 hours).
- Inductors and inductance, Faraday's law, emf. (4 hours).
- Displacement current, Maxwell's Eqs., electromagnetic waves and wave propagation (3 hours).

- Wave propagation in lossless and lossy media (3 hours).
- EM Power, reflection at normal incidence (3 hours).
- Reflection at oblique incidence (3 hours).
- Introduction to transmission lines (2 hours).
- Rectangular waveguides (4 hours).
- Concept of radiation, the Hertzian dipole (2 hours).

**Class/Laboratory Schedule :**

3 lectures per week, 50 minutes each and 3 hours lab per week.

**Contribution of course to Meeting the professional component :**

The electrostatic and magneto static are the basic physical phenomena of most of the electrical systems such as motors, generators, transformers, etc. In addition the electromagnetic wave part is serving as fundamental materials needed for studying the wireless communications. Laboratory projects are designed to promote and strengthen spirit of multi-disciplinary team. The course project is intended to build the students' ability to design a system and its components.

**Course Outcomes:**

- An ability to apply knowledge of mathematics, science, and engineering to the analysis and design of electrical systems involving electric and magnetic fields as well as electromagnetic waves.
- An ability to identify, formulate, and solve engineering problems in the area of electric and magnetic fields and waves.
- An ability to use the techniques, skills, and modern engineering tools such as CAME, necessary for engineering practice.
- An ability to function on multi-disciplinary teams
- Acquire skills to carry out search for technical issues

**Course Outcomes to Program Outcome Mapping:**

Course Outcome	Program Outcome												
	a	b	c	d	e	f	g	h	i	j	k	l	m
1	X	X	X										
2					X								
3											X		
4								X					
5									X				

Prepared by: Dr. Husain A. Jamid, 22-4-2012