Faculty of Engineering
at Shoubra

Model No12
Course Specifications : Electromagnetic Fundamentals

University : Benha university
Faculty : Faculty of Engineering at Shoubra
Department : Electrical Engineering Department

1- Course Data

Course Code: **ECE 212**	Course Title: **Electromagnetic Fundamentals**	Study Year: **Second Year**
Teaching Hours:	Lecture : **4**	Tutorial : **2**

2- Course Aim

For students undertaking this course, the aims are to:

2.1. List the broad classifications of Electromagnetic Fields
2.2. Demonstrate Faraday's laws and Poisson's equation Understand continuity equation and Maxwell's equations of Electric & magnetic fields
2.3. Demonstrate the analogy between Electric & Magnetic Fields

3- Intended Learning Outcomes of Course (ILOs)

a- Knowledge and Understanding

On completing this course, students will be able to:

- **a1.** Define concepts and theories of electric and magnetic fields **(a1)**
- **a2.** Define concepts and theories for Faraday's laws and Poisson's equation **(a2)**
- **a3.** Demonstrate methodologies of data collection interpretation and solving problems related to electric and magnetic fields **(a6)**
- **a4.** Define current engineering technologies for electric and magnetic fields **(a9)**

b- Intellectual Skills

At the end of this course, the students will be able to:

- **b1.** Select appropriate mathematical methods (such as gradient , divergence and curl) for modeling electromagnetic fields **(b1)**
- **b2.** Select appropriate solutions for problems related to electromagnetic fields based on analytical thinking **(b3)**
- **b3.** Think in a creative and innovative way in problem solving especially in electromagnetic **(b4)**
- **b4.** Assess and evaluate the characteristics of electric and magnetic field **(b6)**
- **b5.** Solve problems related to electric and magnetic field, often on the basis of limited information **(b8)**

c- Professional Skills

On completing this course, the students are expected to be able to:

- **c1.** Apply knowledge of mathematics, science and engineering practice to solve problems related to electric and magnetic fields **(c1)**

c2. Use appropriate mathematical methods including differential equations and vector calculus. **(c13)**

d- General Skills

At the end of this course, the students will be able to:

d1. Collaborate effectively within teams **(d1)**

d2. Work in stressful environment and within restrictions **(d2)**

d3. Communicate effectively **(d3)**

4- Course Content

	Topics	No of hours
1	Vector analysis and coordinate systems used in EM fields	8
2	Basic relations of static electric field Gauss' law Laplace eq	8
3	Divergence theorem, electro-static energy	8
4	Magnetic induction Faraday's law,	4
5	Laws analogy between electric & magnetic field	8
6	Time continuity eq, Boundary condition	8
7	Time alternating fields, Maxwell's eq	4

5- Teaching and Learning Methods

1. Modified lectures
2. Class activity
3. Tutorial

6- Teaching and Learning Methods of Disables

1. Lake of projectors in tutorial rooms

7- Student Assessment

a- Student Assessment Methods

1. Assignments
2. Quizzes
3. Midterm Exam
4. Reports
5. Oral Exam
6. Final Exam

b- Assessment Schedule

	Assessment	Weeks
1	Assignments	3,10
2	Quizzes	4,11
3	Midterm Exam	8
4	Reports	6
5	Oral Exam	14
6	Final Exam	15

c- Weighting of Assessments

	Assessment	Weight
1	Assignments	30 of 150 20 %
2	Quizzes	
3	Midterm Exam	
4	Reports	
5	Oral Exam	30 of 150 20 %
6	Final Exam	90 of 150 60 %

8- List of References

a- Course Notes

1. Electromagnetic fields by Dr Hanaa M Raafat

b- Textbooks

1. Clayton R Paul, Introduction to Electromagnetic fields, McGraw-Hill, 1987
2. William H Hayt, Engineering Electromagnetic, McGraw-Hill, 2001

Faculty of Engineering at Shoubra

Model No11(A)
Course Specifications : Electromagnetic Fundamentals

University : Benha university
Faculty : Faculty of Engineering at Shoubra
Department : Electrical Engineering Department

Matrix of Knowledge and Skills of the course

	Topics	week	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
1	Vector analysis and coordinate systems used in EM fields	1,2	a1, a2, a3	b1, b2	c1, c2	
2	Basic relations of static electric field. Gauss' law. Laplace eq.	3,4	a1, a3 ,a4	b1, b2	c1	
3	Divergence theorem, electro-static energy	5,6	a3, a4	b3	c1	
4	Magnetic induction. Faraday's law,	7	a3, a4	b3, b5	c2	
5	Mid term exam	8	a2,a3,a4	b1, b5		
6	Laws analogy between electric & magnetic field.	9,10	a3, a4	b4, b5	c2	
7	Time continuity eq., Boundary condition	11,12	a1	b2	c1	
8	Time alternating fields, Maxwell's eq.	13	a4	b3	c1,c2	
9	Oral exam	14	a1,a2,a3,a4	b1,b2,b3,b4,b5	c1,c2	d1,d2,d3
10	Final exam	15	a1,a2,a3,a4	b1,b2,b3,b4,b5		

Matrix of Course Content and ILO's

Course Title: Electromagnetic Fundamentals **Code**: ECE 212
Lecture: 4 **Tutorials:** 2 **Practical**: - **Total:** 6
Program on which the course is given: BSc Electrical Engineering (Communications)
Major or minor element of program: Major
Department offering the program: Electrical Engineering Department
Department offering the course: Electrical Engineering Department
Academic year / level: **Second** Year / **First** Semester 2014-2015
Date of specifications approval: 20/6/2010

Course content	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	d1	d2	d3
Vector analysis and coordinate systems used in EM fields	✓	✓	✓		✓	✓				✓	✓	✓	✓	
Basic relations of static electric field Gauss' law Laplace eq	✓		✓	✓	✓	✓				✓			✓	
Divergence theorem, electro-static energy			✓	✓			✓			✓			✓	
Magnetic induction Faraday's law,			✓	✓			✓		✓		✓	✓		✓
Laws analogy between electric & magnetic field			✓	✓				✓	✓		✓		✓	
Time continuity eq, Boundary condition	✓					✓				✓				✓
Time alternating fields, Maxwell's eq				✓			✓			✓	✓			

Matrix of course aims and ILO's

Course Title: Electromagnetic Fundamentals **Code**: ECE 212
Lecture: 4 **Tutorials:** 2 **Practical**: - **Total:** 6
Program on which the course is given: BSc Electrical Engineering (Communications)
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Department offering the program: Electrical Engineering Department
Department offering the course: Electrical Engineering Department
Academic year / level: **Second** Year / **First** Semester 2014-2015
Date of specifications approval: 20/6/2010

Course aims	a1	a2	a3	a4	b1	b2	b3	b4	b5	c1	c2	d1	d2	d3
Recognize the broad classifications of Electromagnetic Fields	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓		
Demonstrate Faraday's laws and Poisson's equation Understand continuity equation and Maxwell's equations of Electric & magnetic fields	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Recognize the analogy between Electric & Magnetic Fields	✓		✓	✓				✓	✓		✓		✓	

Course Instructor: Dr Hanaa Mohammed Raafat

Head of department: Prof Dr Sayed Abo-Elsood Ward