Faculty of Engineering at Shoubra .

Model No.12
Course Specifications : Electromagnetic Waves

University : Benha university

Faculty : Faculty of Engineering at Shoubra .

Department : Electrical Engineering Department

1- Course Data

Course Code : ECE 313 Course Title : Electromagnetic Waves Study Year : Third Year

Specialization : Electronics and Communications
Teaching Hours:
Lecture : 4 Tutorial : 2 Practic

2- Course Aim

For students undertaking this course, the aims are to:

2.1- Acquire the background needed for a clear understanding of the basics of electromagnetic waves.
2.2- Understand Maxwell's equations and their fundamental solutions.
2.3- Apply the basic concepts of electromagnetism to solve the problems of wave reflection and transmission.
2.4- Apply these concepts in the analysis of simple guided wave structures.

3- Intended Learning Outcomes of Course (ILOS)

a- Knowledge and Understanding

On completing this course, students will be able to:
a-1- Define concepts and theories of mathematics, appropriate to electromagnetic waves and wave equation (a.1)
a-2- Define concepts and theories of sciences, appropriate to waves propagation and reflections (a.2)

b- Intellectual Skills

At the end of this course, the students will be able to:
b-1 - Select appropriate mathematical methods for modeling for wave guide. (b- 2)
b-2 - Select appropriate solutions for Maxwell equations. (b- 3)
b- 3 - Solve engineering problems, often on the basis of limited information. (b- 8)

c- Professional Skills

On completing this course, the students are expected to be able to:
c- 1 - Apply knowledge of mathematics and science to solve engineering electromagnetics problems. (c- 1)
c- 2 - Apply numerical modeling methods to polarization problems. (c- 7)
c- 3 – Use appropriate mathematical methods or IT tools like java applets.(c- 13)

d- General Skills

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

d- 1 - Refer to relevant literatures. (d-9)
d- 2 - Develop skills related to creative and critical thinking as well as problem solving (d- 12)

4- Course Contents

No.	Topics	No of hours
1	Maxwell' Equations	4
2	Maxwell' Equations	4
3	fundamental solutions	4
4	fundamental solutions	4
5	Solutions of the Wave Equation	4
6	Wave propagation in material media	4
7	Energy Conservation of the Electromagnetic Fields and Poynting Theorem	4
8	Mid term	
9	Reflection and transmission of EM waves: TE and TM Waves	4
10	Total Transmission	4
11	Evanescent Waves	4
12	Basics of guided waves: Parallel Plate Waveguide	4
13	Modes of Propagation	4
14	TE modes and TM modes	4
15	Phase and group velocities	4

5- Teaching and Learning Methods

5.1- Lectures
5.2- Class activity
5.3- Case study

6- Teaching and Learning Methods of Disables

6.1- Not Applicable

7- Student Assessment

a- Student Assessment Methods

1	Assignments to assess knowledge, professional skills and general skills
2	Quiz to assess knowledge and intellectual skills
3	Mid-term exam to assess knowledge and intellectual skills.
4	Oral Exam to assess knowledge, intellectual skills and general skills
5	Final exam to assess knowledge, intellectual and practical skills

b- Assessment Schedule

No.	Assessment	Week
1	Assessments	3,6,11
2	Quizzes	4,7,10,12
3	Mid-term exam	8
4	Oral Exam	14
5	Final exam	15

c- Weighting of Assessments

Assessment	Weight
Midterm Examination	20 %
Final Term Examination	60 %
Oral Examination	10 %
Semester work	10 %
Total	100 %

8- List of References

a- Books

1. David K. Cheng: “Field and Wave Electromagnetics”, Addison-Wesley, second edition.
2. W. Hayt: “Engineering Electromagnetics”, seventh edition, McGraw-Hill
3. R. Collin: “Foundation s for Microwave Engineering” second edition, McGraw-Hill

b- Recommended Books

1. John David Jackson “Classical Electrodynamics” Third Edition, John Wiley & Sons, Inc.
2. RICHARD FITZPATRICK: “MAXWELL’S EQUATIONS AND THE PRINCIPLES OF ELECTROMAGNETISM”, Infinity Science Press LLC, Hingham, Massachusetts, New Delhi

c- Periodical

1- IEEE Transactions on Wireless Communications
2- IEEE Transactions on Magnetics
3- IEEE Wireless Communications

Course coordinator Assoc. Prof. Dr.M. Lotfy Rabeh

Head of department: Prof. Dr. Sayed abo-Elswood Ward

Faculty of Engineering at Shoubra

Model No.11A
Course Specifications : Electromagnetic Waves

University : Benha university

Faculty : Faculty of Engineering at Shoubra

Department : Electrical Engineering Department

Matrix of Knowledge and Skills of the course

Matrix of Knowledge and Skills of the course

No.	Topics	week	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
1	Maxwell' Equations	1	a.1	b.1	c.3	d.1
2	fundamental solutions of the Wave Equation	2	a.1	b.2	c.3	d.1
3	Wave propagation in material media and wave polarizations.	3	a.1, a.2	b.2, b.3	c.1, c.3	d.1
4	Energy Conservation and Poynting Theorem	4	a.2	b.2, b.3	c.1, c.3	d.2
5	Reflection and transmission of EM waves: Normal Incidence	5	a.1, a.2	b.1	c.1, c.2	d.1
6	Reflection and transmission: Oblique Incidence	6	a.1, a.2	b.1	c.1, c.2	d.1
7	Total Internal Reflection and Evanescent Waves	7	a.2	b.1, b.3	c.1, c.2	d.2
8	Midterm	8				
9	Total Transmission and Brewster angle	9	a.2	b.1, b.2	c.1, c.3	d.2
10	Basics of guided waves	10	a.2	b.1, b.2	c.1, c.3	d.1, d.2
11	Parallel Plate Waveguide	11	a.2	b.2, b.3	c.1, c.3	d.1, d.2
12	Modes of Propagation and cutoff	12	a.2	b.2, b.3	c.1, c.3	d.1, d.2
13	Group and phase velocity	13	a.2	b.2, b.3	c.1, c.3	d.1, d.2
14	Oral Exam	14				
15	Final Exam	15				

Course coordinator: Assoc. Prof. Dr.M. Lotfy Rabeh
Course instructor Assoc. Prof. Dr.M. Lotfy Rabeh
Head of department: Prof. Dr. Sayed Ward

Matrix of course content and ILO's

Course Title: Electromagnetic Waves **Code**: ECE313

Lecture: 4 **Tutorial**: 2 **Practical**: -

Total:6

Program on which the course is given: B.Sc. 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: **Third** Year / **First** Semester **2014-2015**

Date of specifications approval: 20/6/2010

Course content	**a1**	**a2**	**b1**	**b2**	**b3**	**c 1**	**c 2**	**c 3**	**d1**	**d2**
Maxwell' Equations - fundamental solutions of the Wave Equation - Wave propagation in material media and types of wave polarizations.	✓	✓	✓	✓	✓			✓	✓	
Energy Conservation of the Electromagnetic Fields and Poynting Theorem - Reflection and transmission of EM waves: Normal Incidence and Oblique Incidence - Total Internal Reflection and Evanescent Waves - Total Transmission and Brewster angle	✓	✓		✓	✓	✓	✓		✓	✓
Basics of guided waves - Parallel Plate Waveguide		✓		✓	✓	✓		✓	✓	✓
Modes of Propagation and cutoff - Group and phase velocity		✓		✓	✓	✓		✓	✓	✓

Matrix of course aims and ILO's

Course Title: Electromagnetic Waves **Code**: ECE313

Lecture: 4 **Tutorial**: 2 **Practical**: -

Total:6

Program on which the course is given: B.Sc. Electrical Engineering (Communications)

Major or minor element of program: Major

Department offering the program: Electrical Engineering Department

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Academic year / level: **Third** Year / **First** Semester 2014-2015

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Course aims	**a1**	**a2**	**b1**	**b2**	**b3**	**c1**	**c2**	**c3**	**d1**	**d2**
Understand and use Maxwell' Equations - Wave Equation - Wave propagation - wave polarizations.	✓	✓	✓	✓	✓	✓		✓	✓	
Verify and apply the energy conservation concept of the Electromagnetic Fields and Poynting Theorem – Apply the Boundary conditions to the reflection and transmission of EM waves: Normal and Oblique Incidence - Total Reflection and Evanescent Waves - Total Transmission and Brewster angle	✓	✓		✓	✓	✓	✓	✓	✓	✓
Apply the basics of guided wave concepts - Parallel Plate Waveguide Modes - Propagation and cutoff - Group and phase velocity		✓	✓	✓		✓		✓	✓	✓

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