



Faculty of Engineering at
Shoubra

Model No.12

Course Specifications : Microwave Fundamentals

University : Benha university

Faculty : Faculty of Engineering at Shoubra

Department : Electrical Engineering Department

1- Course Data

Course Code : ECE 344 Course Title : Microwave Fundamentals Study Year : Third Year
Specialization :
Teaching Hours:
Lecture : 4 Tutorial : 2 Practical :

2- Course Aim

For students undertaking this course, the aims are to:

- 2.1- Describe principles of microwave engineering and technology.
- 2.2- Derive and solve the wave equations in many microwave structures such as transmission lines and waveguides to analyze the wave propagation along them.
- 2.3- Use of Smith chart for determining the wave characteristics on a transmission line and determine the input impedance and calculate perform the impedance matching
- 2.4- Investigate different passive microwave components such as: power dividers/combiners, couplers, resonators and cavities.

3- Intended Learning Outcomes of Course (ILOS)

a- Knowledge and Understanding

On completing this course, students will be able to:

- a- 1) Define basics of microwave fundamentals. **“a3”**
- a- 2) Illustrate methodologies of data collection interpretation and solving microwave problems. **“a6”**
- a-3) Define current engineering technologies as related to Microwave Engineering **“a9”**
- a-4) Explain elementary science underlying electronic microwave systems. **“a15”**
- a-5) Explain elementary science underlying microwave Transmission Line Theory. **“a16”**
- a- 6) Write Microwave applications. **“a24”**
- a.7) Describe wave propagation and explain antenna propagation. **“a25”**

b- Intellectual Skills

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

- b-1) Select suitable mathematical methods related to microwave systems. **“b1”**
- b-2) - Choose suitable computer based methods such as Advanced Design System (ADS) program for analyzing problems. **“b2”**
- b-3) Think in a creative and innovative way for the design of microwave circuits. **“b4”**
- b-4) Check the failure of components and systems related to microwave technology. **“b7”**
- b-5) Judge decisions of microwave engineering considering balanced costs, benefits, safety, quality, reliability, and environmental impact. **“b10”**

c- Professional Skills

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

- c- 1) Establish and/or re-design a process, component or system, and perform specialized designs of microwave circuits. **“c3”**
- c- 2) Practice the aesthetics in design of a system and approach. **“c4”**
- c- 3) Troubleshoot, maintain and repair all types of electronic microwave systems by using the standard tools. **“c17”**

d- General Skills

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

- d- 1) work within a team. **“d1”**

- d- 2) Work in stressful environment and within some engineering constraints. “d2”
- d- 3) Search for information and engage in life-long self-learning microwaves fundamentals. “d7”
- d- 4) Write reports and presentation related to microwave topics. “d10”

4- Course Contents

No.	Topics	No of hour
1	Course Objectives and Outline & Review of Electromagnetic Fields	4
2	General Transmission Line Theory & Circuit Model of Transmission lines	4
3	General Transmission Line Equations & Standing Wave Properties	4
4	Transmission Line Parameters & Lossless Transmission Line	
5	Matching techniques - Quarter wavelength transformer - Smith chart - Single stub matching-Double stub matching	4
6	Advanced Design System (ADS) program- Simulation for microwave circuits	4
7	Rectangular Waveguide	4
8	Power transmitted in rectangular waveguide	4
9	Microstrip Transmission Line Structure & Stripline Transmission Line Structure	4
10	Microwave network analysis-S matrix-Z matrix-Y matrix-ABCD matrix	4
11	Microwave Passive devices- analyze and design Directional coupler	4
12	Microwave Passive devices- analyze and design Power dividers	4

5- Teaching and Learning Methods

- 5.1- Modified lectures
- 5.2- Class discussion
- 5.3- Software simulations
- 5.4- technical report
- 5.5- Tutorial problems

6- Teaching and Learning Methods of Disables

Nothing

7- Student Assessment

a- Student Assessment Methods

1	Assignments to assess knowledge and intellectual skills.
2	Quiz to assess knowledge and intellectual skills.
3	Mid-term exam to assess knowledge, general and intellectual skills.
4	Technical report on modified microwave devices to assess knowledge and intellectual skills.
5	Final exam to assess knowledge, general and intellectual skills.

b- Assessment Schedule

No.	Assessment	Week
1	Assignments on	2,3,5,7,9,11,12,13
2	Quizzes on	4, 10
3	Mid-term exam on	8
4	technical report	14
5	final exam	15

c- Weighting of Assessments

Assessment	Weight
Mid_Term Examination	13 %
Final_Term Examination	67 %
Oral Examination	0 %
Practical Examination	0 %
Semester work	5 %
Other types of assessment	15 %
Total	100 %

8- List of References

a- Books

- 1- David M. Pozar "Microwave Engineering" 4nd Edition Wiley publishing:2011 (ISBN-10: 0470631554)

b- Recommended Books

- 1- T. Koryu Ishii "Handbook of Microwave Technology, Volume 1: Components and Devices" Acadmec press 1995



No.11A

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

Matrix of Knowledge and Skills of the course

No.	Topics	Week	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
1	Course Objectives and Outline & Review of Electromagnetic Fields	1	a5, a6,a7			
2	General Transmission Line Theory & Circuit Model of Transmission lines	2	a1			
3	General Transmission Line Equations & Standing Wave Properties	3		b1		
4	Transmission Line Parameters & Lossless Transmission Line	4	a2			
5	Matching techniques - Quarter wavelength transformer - Smith chart - Single stub matching- Double stub matching	5	a1, a2	b2,b3.b4	c1, c3	
6	Advanced Design System (ADS) program- Simulation for microwave circuits	6	a2	b2,b3.b4	c1, c2	d1,d2, d3,d4
7	Rectangular Waveguide	7	a1, a3	b5		
8	Mid term exam	8	a1, a3 a6	b1,b3 ,b4		d1,d2, d3,d4
9	Power transmitted in rectangular waveguide	9	a4	b1		
10	Microstrip Transmission Line Structure & Stripline Transmission Line Structure	10	a3	b5		
11	Microwave network analysis-S matrix-Z matrix-Y matrix-ABCD matrix	11	a1	b1,b4		
12	Microwave Passive devices- analyze and design Directional coupler	12	a2, a3, a4,a6	b1,b2,b3	c1, c3	
13	Microwave Passive devices- analyze and design Power dividers	13.14	a2, a3, a4,a6	b2,b3,b5	c1, c3	
15	Final exam	15	a1, a3, a4, a6	b1, b3, b5		

rectangular waveguide																			
Microstrip Transmission Line Structure & Stripline Transmission Line Structure			✓									✓							
Microwave network analysis-S matrix-Z matrix-Y matrix-ABCD matrix	✓							✓			✓								
Microwave Passive devices-analyze and design Directional coupler		✓	✓	✓		✓		✓	✓	✓			✓		✓				
Microwave Passive devices-analyze and design Power dividers		✓	✓	✓		✓			✓	✓		✓	✓		✓				

Matrix of course aims and ILO's

Course Title: Microwave Fundamentals **Code:** ECE344
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 / Second Semester**
Date of specifications approval: 20/6/2010

Course content	a1	a2	a3	a4	a5	a6	a7	b1	b2	b3	b4	b5	c1	c2	c3	d1	d2	d3	d4
Understanding the principles of microwave engineering and technology.	✓				✓	✓													
Derive and solve the wave equations in many microwave structures such as transmission lines and waveguides to analyze the wave propagation along them	✓	✓	✓					✓				✓							
Use of Smith chart for determining the wave characteristics on a transmission line and determine the input impedance and calculate perform the impedance matching	✓	✓							✓	✓	✓		✓		✓				
Investigate different passive microwave components such as: power dividers/combiners, couplers, resonators and cavities.		✓	✓	✓		✓		✓	✓	✓		✓	✓		✓				

Course coordinator: Dr.Gehan Sami
Course instructor Dr. Gehan Sami
Head of department: Prof. Dr.Sayed Abu-Elsood Ward
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