

## **EC546- Microwave Technology**

### **CREDIT HOURS**

3 Hours

### **CONTACT HOURS (Hours/week)**

Lecture: 2; Tutorial: 2

### **COURSE COORDINATOR**

Dr. Mohammed Abou-El Dahb

### **TEXT BOOK**

Microwave device Circuits, Samuel Liao, Prentice Hall

### **COURSE DESCRIPTION**

Comprehensive knowledge of microwave hardware. This includes passive and active components. The study extends to the design and analysis of all generating and amplifying devices. Also exploring the different measuring techniques used at such frequency range as well as the related measuring techniques.

### **PREREQUISITE:**

EC443, EC434

### **RELATION OF COURSE TO PROGRAM**

Elective

### **COURSE INSTRUCTION OUTCOMES**

The student will be able to provide the student with detailed analysis of the theory and design equation of all microwave active and passive components. The study comprises tube-type and semiconductor device covering a wide range of a power and frequencies.

### **TOPICS COVERED**

- Introduction: The Microwave Band, why microwaves and their applications
- Motion of charged particles in E and M fields
- HF limitations of conventional vacuum tubes, and transistors.
- Microwave amplifiers: Klystron amplifier theory and analysis.
- Microwave Oscillators: Reflex Klystron theory and analysis.
- TWT amplifier.
- Crossed field amplifier, parametric amplifier
- Microwave components: Magic T isolators, circulators, Duplexers directional couplers, and derivation of scattering parameters.
- Microwave integrated circuits' techniques and micro-strip lines.
- Microwave Filters and Resonators.
- Microwave Oscillators, magnetron oscillator.
- Microwave mixers: crystal mixers and Rate Race mixer.

- Microwave devices: Varactors and tunnel diodes. Theory and characteristics, Gunn diodes, theory and characteristics
- Microwave measurements techniques, noise figure and power measurements.

**CONTRIBUTION OF COURSE TO MEET THE REQUIREMENTS OF CRITERION 5:**

<b>Professional component Content</b>			
<b>Math and Basic Sciences</b>	<b>Engineering Topics</b>	<b>General Education</b>	<b>Other</b>
	✓		

**RELATIONSHIP OF COURSE TO STUDENT OUTCOMES:**

<b>Student Outcomes</b>		<b>Course aspects</b>
A	An ability to apply knowledge of mathematics, science, and engineering	a <sub>1</sub> a <sub>2</sub>
B	An ability to design and conduct experiments, analyze and interpret data.	b <sub>1</sub> b <sub>2</sub> b <sub>3</sub> b <sub>4</sub>
C	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economics, environmental, social, political, ethical, health, and safety, manufacturability, and sustainability	
D	An ability to function on multi-disciplinary teams.	
E	An ability to identify, formulate, and solve engineering problems	e <sub>1</sub> e <sub>2</sub> e <sub>3</sub>
F	An understanding of professional and ethical responsibility	
G	An ability to communicate effectively	
H	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and social content	
I	A recognition of the need for, and an ability to engage in life-long learning.	
J	A knowledge of contemporary issues within and outside the electrical engineering profession.	
k	An ability to use the techniques, skills, and modern engineering tools necessary for electrical engineering practice.	k