



MUTAH UNIVERSITY
Faculty of Engineering
Department of Electrical Engineering



Course Syllabus

Course Code	Course Name	Credits	Contact Hours
0401453	Microwave Engineering	3	3 T

INSTRUCTOR/COORDINATOR

Name	Dr. Saqer Alja' Afreh
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Office Hours	1:00-14:00 (Tues)

TEXTBOOK

Title	Microwave Engineering
Author/Year/Edition	David M. Pozar.
Other Supplemental Materials	
Title	Advanced Microwave Devices and Circuits
Author/Year/Edition	Samuel Y. Liao

SPECIFIC COURSE INFORMATION

A. Brief Description of the Content of the Course (Catalog Description)

The aim of this course is to provide the foundation for microwave theory and techniques. Waveguides, Microwave Network Analysis Scattering parameters and signal flow diagrams Power Dividers and Directional Couplers, Passive networks and RF filters, Active RF components, Microwave Passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Circulator, Isolator and Resonator.

B. Pre-requisites (P) or Co-requisites (C)

Fields and Waves (0401353) (P)

C. Course Type (Required or Elective)

Required

SPECIFIC GOALS

A. Course Learning Objectives (CLOs)

By the end of this course, the student should be able to:

CLO1: Understand microwave basics such as lumped element theory and distributed element theory [1].

CLO2: Recognize microwave waveguides, resonators, and waveguide cavities [1].

CLO3: Demonstrate Microwave Network Analysis; Scattering parameters and signal flow diagrams [1].

CLO4: Evaluate and **characterize** a passive microwave components [1].

B. Student Learning Outcomes (SOs) Addressed by the Course

1	2	3	4	5	6	7
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BRIEF LIST OF TOPICS TO BE COVERED

List of Topics	No. of Weeks	Contact Hours
<ul style="list-style-type: none"> • The Lumped-Element Circuit Model for a Transmission Line • Field Analysis of Transmission Lines 	2	6
Microwave Waveguides <ul style="list-style-type: none"> • Parallel Plate Waveguide • Rectangular Waveguide • Circular Waveguide • Wave Velocities and Dispersion • Microstrip Line • Impedance Matching 	2	6
Microwave Network Analysis <ul style="list-style-type: none"> • Scattering parameters and signal flow diagrams • Impedance and Equivalent Voltages and Currents • Impedance and Admittance Matrices • The Scattering Matrix • The Transmission (ABCD) Matrix • Signal Flow Graphs • Discontinuities and Modal Analysis • Excitation of Waveguides • Electric and Magnetic Currents • Attenuator, Circulator, Isolator and Resonator 	3	9
Microwave Resonator <ul style="list-style-type: none"> • Series and Parallel Resonant Circuits • Transmission Line Resonators • Rectangular Waveguide Cavity Resonators • Circular Waveguide Cavity Resonators • Dielectric Resonators - Excitation of Resonators 	3	9
Power Dividers and Directional Couplers Basic Properties of Dividers and Couplers The T-Junction Power Divider	4	12

The Wilkinson Power Divider Waveguide Directional Couplers The Quadrature (90°) Hybrid Coupled Line Directional Couplers		
Total	14	42

EVALUATION		
Assessment Tool	Due Date	Weight (%)
Mid Exam	According to the university calendar	30
Course Work (Homeworks, Quizzes, Projects, ...etc.)	One week after being assigned	20
Final Exam	According to the university calendar	50

ABET's Students Learning Outcomes (Criterion # 3)		
Relationship to program outcomes		
ABET 1-7	Engineering Student Outcomes	
1	√	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2		an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3		an ability to communicate effectively with a range of audiences.
4		an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5		an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6		an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7		an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.