

# ECE 5017: Microwave Engineering

## Course Description

Transmission line theory; multiconductor; S-parameters; transformers, couplers, filters, resonators, circulators; electromagnetic interference and compatibility; computer-aided design; microstrip realization and testing with a network analyzer.

**Prior Course Number:** 710

**Transcript Abbreviation:** Microwave Circuits

**Grading Plan:** Letter Grade

**Course Deliveries:** Classroom

**Course Levels:** Undergrad, Graduate

**Student Ranks:** Senior, Masters, Doctoral

**Course Offerings:** Autumn

**Flex Scheduled Course:** Never

**Course Frequency:** Every Year

**Course Length:** 14 Week

**Credits:** 4.0

**Repeatable:** No

**Time Distribution:** 3.0 hr Lec, 3.0 hr Lab

**Expected out-of-class hours per week:** 6.0

**Graded Component:** Lecture

**Credit by Examination:** No

**Admission Condition:** No

**Off Campus:** Never

**Campus Locations:** Columbus

**Prerequisites and Co-requisites:** Prereq: 3010 (312), and enrollment in ECE major; or Grad standing in Engineering, Biological Sciences, or Math and Physical Sciences.

**Exclusions:** Not open to students with credit for 710.

**Cross-Listings:**

**Course Rationale:** Existing course.

**The course is required for this unit's degrees, majors, and/or minors:** No

**The course is a GEC:** No

**The course is an elective (for this or other units) or is a service course for other units:** Yes

**Subject/CIP Code:** 14.1001

**Subsidy Level:** Doctoral Course

## Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

## Course Goals

Give the student a comprehensive introduction to microwave circuit design which provides practical design theories for the design and synthesis of passive microwave circuits
Introduce the use of CAD tools to verify the microwave circuits designed, account for real world implementation effects, and optimize the microwave circuits designed

Expose the students to the measurements of microwave circuits using a network analyzer
Involve the students in a team oriented design project where they design, fabricate, and test a microwave circuit and present their results to the class

## Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Transmission lines (review) and multiconductor lines	5.0		4.0					
Waveguides	3.0		2.0					
Broadband impedance matching	5.0							
Scattering parameters	4.0							
Passive devices components (tee, divider, couplers)	6.0		3.0					
Resonators and narrowband filters	4.0		1.5					
Broadband and periodic filters	7.0		1.5					
Circulators and isolators	3.0		3.0					
Introduction to electromagnetic interference and compatibility (EMI/EMC)	3.0							
Design, simulation, fabrication and testing of a microwave circuit			10.0					
In class presentation of design projects			3.0					

## Representative Assignments

Homework problems are assigned by the instructor
Computer aided simulation
Lab reports
Poster on design project
Oral presentation of design project

## Grades

Aspect	Percent
Homework (include computer assignments)	15%
Midterm #1	20%
Midterm #2	20%
Final exam	20%
Laboratories: lab #1 (1/4), lab #2 (1/4), lab #3 (1/4), design project (1/4)	25%

## Representative Textbooks and Other Course Materials

Title	Author
<i>Microwave Engineering, 4th ed., John Wiley</i>	David Pozar

## ABET-EAC Criterion 3 Outcomes

Course Contribution	College Outcome
***	a An ability to apply knowledge of mathematics, science, and engineering.

Course Contribution		College Outcome
***	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
***	c	An ability to design a system, component, or process to meet desired needs.
*	d	An ability to function on multi-disciplinary teams.
	e	An ability to identify, formulate, and solve engineering problems.
	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 and societal context.
	i	A recognition of the need for, and an ability to engage in life-long learning.
	j	A knowledge of contemporary issues.
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

### CpE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
	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

### EE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
	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

## **Additional Notes or Comments**

Change prereqs to match CORRECTIONS THAT WE SUBMITTED TO UNIVERSITY. Their original ordering changed the order, and thus the meaning of the prereqs. Exclusiong changed to match university version.

Updated text edition to 4th, 4/3/12.

Contributions to new ABET Outcomes added 6/14/2019 BLA

**Prepared by:** Betty Lise Anderson