

Course Syllabus

EEL 4421 – Introduction to RF Circuit Design

EEL 5426 – RF Circuit Design

Professor Elias A. Alwan

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Office Hours: MT 03:30-5:00 pm

Office: EC 3952

Course Description and Purpose

The course introduces the basic concepts of transmission lines theory, microwave network analysis, impedance matching and tuning, microwave resonators, power dividers and directional couplers, and microwave filters. Full-wave simulation software will be used.

COURSE INFORMATION

Course: EEL 4421 – EEL 5426 (3 credits)

Sections: EEL 4421-U01, EEL 5426-Sections U01 & RXA & RXAX & RXPC & RXPD & RXPE - Spring 2022

Room: 1107

Meeting Time: Tuesday 06:25-9:05 pm

INSTRUCTOR INFORMATION

Prof. Elias Alwan

Phone: (305) 348-5424 | **Email:** ealwan@fiu.edu (<mailto:ealwan@fiu.edu>)

Office: EC 3952

Office Hours: MT 3:30 PM - 5:00 PM (Instructor), By Appointment (TA)

Room: EC3265B **TA:** Anthony Nuñez (antnunez@fiu.edu (<mailto:antnunez@fiu.edu>))

Room: EC3952 **Instructor:** Dr. Alwan (ealwan@fiu.edu (<mailto:ealwan@fiu.edu>))

REQUIRED RESOURCES

Textbook: David Pozar "Microwave Engineering," 4th Edition, John Wiley & Sons, 2011, ISBN-13: 978-0470631553.

Prerequisites: EEL 3135 and EEL 3110

Course Objectives

Upon completing this course, students will be able to:

- Understand the basic concepts of passive microwave devices
- Learn transmission line theory
- Understand microwave network analysis
- Learn different impedance matching and tuning techniques
- Learn the basics of microwave resonators
- Design power dividers and direction couplers
- Learn microwave filter design

Sample Grading Scheme

Letter	Range%	Letter	Range%	Letter	Range%
A	95 or above	B	83 - 86	C	70 - 76
A-	90 - 94	B-	80 - 82	D	60 - 69
B+	87 - 89	C+	77 - 79	F	59 or less

GRADING POLICY

Homework Quizzes	15%
Project	10%
Exam I	25%
Exam II	25%
Final	25%

HOMEWORK

- Will be assigned weekly and no submission is required
- Solutions will be posted with the homework
- Homework Quizzes will be posted on Canvas and will be based on multiple choices

PROJECT

- Students are encouraged to form a team of up to 5 students.
- Each group should have at least one graduate student.
- Graduate student will be responsible of fabrication and lab testing

MIDTERMS

- Midterms are in class.
- Open book, open notes.
- **Based on Class and Homework.**
- **There is a possibility for a web-based or take home exam.**

FINAL EXAM

- **Comprehensive**
- **Web-based (multiple choice).**

SOFTWARE

Matlab/Simulink or Cadence Microwave Office or Agilent ADS.

TOPICS

1. Transmission line theory: lumped-element circuit model, Smith chart, lossy transmission lines
2. Microwave network analysis: impedance and admittance matrices, scattering matrix, ABCD matrix, signal flow graphs
3. Impedance matching and tuning: matching with lumped elements, single stub tuning, double-stub tuning, quarter-wave transformer, theory of small reflections, binomial multi-section matching transformer, Chebyshev multi-section matching transformer, tapered line
4. Microwave resonators: series and parallel resonant circuits, transmission line resonators
5. Power dividers and directional couplers: T-junction power divider, Wilkinson power divider, quadrature hybrid, coupled line directional couplers, Lange coupler, 180° hybrid
6. Microwave filters: periodic structures, filter implementation, stepped impedance low pass filter, coupled lines filters, filter using coupled resonators.

COURSE CONTENT

Session	Topics	Book Chapter
Week 1	Syllabus / Transmission Line Theory	2
Week 2	Transmission Line Theory	2
Week 3	Microwave Network Analysis	4
Week 4	Microwave Network Analysis	4
Week 5	Exam I	Chapters 2 and 4
Week 5	Impedance Matching and Tuning	5
Week 6	Impedance Matching and Tuning	5
Week 7	Power Dividers and Directional Couplers	7
Week 8	Power Dividers and Directional Couplers	7
Week 9	Exam II	Chapters 5 and 7
Week 10	Microwave Filters	8
Week 11	Microwave Filters	8

Week 12	Microwave Filters/Resonators	8/6
Week 13	Final Exam	Chapters 6 7 8

Important Information

Before starting this course, please review the following pages:

- [Accessibility and Accommodation](#)
- [Academic Misconduct Statement](#)

*The professor reserves the right to change or modify the syllabus at any time during the semester