ELEN421 16

Course Summary

Course : ELEN421 **Title :** RF/Microwave Engineering I
Length of Course : 16
Prerequisites : ELEN420, ELEN310 **Credit Hours :** 3

Description

Course Description: This course covers the fundamental concepts of passive microwave circuit analysis and design. Topics include electromagnetic theory, propagation of electromagnetic waves in various transmission media, microwave network analysis, the Smith Chart, impedance matching & tuning, resonators, power dividers, directional couplers, and microwave filters. At the end of this course, you will have an understanding of the key concepts and components associated with passive microwave circuits. NOTE: This course requires the student to purchase additional materials that are not covered by the book grant. Please refer to the Course Materials section for additional details. Prerequisites: ELEN310 and ELEN420

Course Scope:

At the end of this course you will have an understanding of the key concepts and basic theories of microwaves and microwave circuits.

Objectives

After completing the course, the student should be able to accomplish these Course Learning Objectives (CLOs):

1. Explain RF & Microwave Theory
2. Analyze transmission lines, including quarter wave transformers & impedance mismatches
3. Explain the capabilities of microwave power dividers, directional couplers, and microwave filters
4. Analyze the performance of individual RF/Microwave components
5. Analyze an RF/Microwave network
6. Design an RF circuit to solve a specific problem or requirement using common RF design tools
7. Prepare effective communication material using technical data

Outline

Week 1: Introductions; Intro to RF/Microwave Theory

Learning Objective(s)

CLO-1

Readings

Textbook

Pgs 1-8

Assignment(s)

Forum 1 Topic: Introduce Yourself

Assignment 1: Intro to RF/Microwave

Week 2: Basic Electromagnetic Theory

Learning Objective(s)

CLO-1

Readings

Textbook

Pgs 9-38

Assignment(s)

Assignment 2: Emag Theory

Week 3: Guided Electromagnetic Propagation

Learning Objective(s)

CLO-1

CLO-2

Readings

Textbook

Pgs 39-88

Assignment(s)

Assignment 3: Guided Emag Theory

Week 4: Part I Review

Learning Objective(s)

CLO-1

Readings

See weeks

1-3

Assignment(s)

Forum 4 Topic: Lessons Learned

Test #1

Week 5: Microwave Circuits

Learning Objective(s)

CLO-2

Readings

Textbook

Pgs 91-129

Assignment(s)

Assignment 5: Microwave Circuits

Week 6: Resonators & Cavities

Learning Objective(s)

CLO-4

Readings

Textbook

Pgs 131-161

Assignment(s)

Assignment 6: Resonators & Cavities

Week 7: Impedance Matching

Learning Objective(s)

CLO-3

Readings

Textbook

Pgs 163-185

Assignment(s)

Assignment 7: Impedance Matching

Week 8: Part II Review

Learning Objective(s)

CLO-2

CLO-3

CLO-4

Readings

See weeks

5-7

Assignment(s)

Forum 8 Topic: Lessons Learned

Test #2

Week 9: Passive Microwave Components

Learning Objective(s)

CLO-4

Readings

Textbook

Pgs 187-235

Assignment(s)

Assignment 9: Passive Microwave Components

Week 10: Microwave Filters

Learning Objective(s)

CLO-4

Readings

Textbook

Pgs 237-286

Assignment(s)

Forum 10 Topic: RF & Microwave on the Web

Assignment 10: Microwave Filters

Week 11: Concepts for Component Design

Learning Objective(s)

CLO-5

Readings

Textbook

Pgs 289-360

Assignment(s)

Assignment 11: Concepts for Comp. Design

Week 12: Microwave Control Components

Learning Objective(s)

CLO-4

Readings

Textbook

Pgs 363-413

Assignment(s)

Assignment 12: Microwave Control Components

Week 13: Part III Review

Learning Objective(s)

CLO-4

CLO-5

Readings

See weeks

9-12

Assignment(s)

Forum 13 Topic: Lessons Learned

Test #3

Week 14: Practical Considerations

Learning Objective(s)

CLO-6

Readings

Web resources listed in lesson

Assignment(s)

Assignment 14: Practical Considerations

Week 15: Final Project

Learning Objective(s)

CLO-6

CLO-7

Readings

Web resources listed in lesson

Assignment(s)

Test #4
(Final Project)

Week 16: Course Review & Wrap-up

Learning Objective(s)

CLO-1 through CLO-7

Readings

See weeks 13-15

Assignment(s)

Forum 16 Topic: Lessons Learned

Evaluation

Instructor announcements: Weekly announcements will appear on Monday of each week in the online classroom. They will also be e-mailed to each student. The announcements discuss the assignments and any other pertinent information for the week.

This is an upper level course. All students' work is to be presented as such in terms of quality and content. The grading system is based on eight forums (20%), eleven homework assignments (40%), and four tests 40%).

Reading Assignments: Refer to the Course Outline section of this syllabus for the weekly reading assignments

Week 1 Introductions: Within 7 days of course start, you must log into the classroom and introduce yourself to the class. Your response is due by Sunday of Week 1. Your response must be a minimum of 250 words (a requirement) and should include the information listed in the Forum instructions.

Weekly Forums: There are two kinds of discussion forums in this course. The first are for course-specific topics chosen by the instructor. These are graded assessments. The second are free-form forums for questions and topics generated by the students. Students are fee to post any relevant question in the free-form forums but should avoid asking questions about specific gradable test questions. If there are questions about specific test questions, find a similar problem in the book and ask a question on that problem or concept instead. Asking questions about specific test questions creates an unfair advantage and defeats the purpose of the assessment tool.

Exams: There are four exams, each worth 10% of your final grade. It is an open book, open note exam. It is administered without a proctor. Students must complete the exams by the end of the week indicated in the schedule.

Lab Exercises: Where specified, homework assignments may take the form of virtual lab exercises completed in a computer simulation environment. Because modern RF/microwave engineering is highly dependent on computer simulation, participation in these assignments is mandatory. If you fail to participate in the lab-based assignments in a meaningful way, you will not pass the course.

Grading:

Name	Grade %

Materials

Book Title: Microwave and RF Engineering, 1st ed - the e-book is provided in the APUS Online Library

Author: Sorrentino

Publication Info: Wiley Lib

ISBN: 9780470758625

Book Title: NI Student Software Suite - access instructions provided inside the classroom

Author: National Instruments

Publication Info: National Instruments

ISBN: 779252-3501

Book Title: To find the library e-book(s) req'd for your course, please visit http://apus.libguides.com/er.php to locate the eReserve by course #. You must be logged in to eCampus first to access the links.

Author: N/A

Publication Info: N/A

ISBN: N/A

The text for this class is provided as an E-Book in the e-reserves of the APUS online library. E-books provided in the APUS Online Library are not accessible through the APUS Bookstore. If you wish to purchase the hard copy book instead of using the e-book in the library, you may do so through the APUS Bookstore or from any other bookseller of your choice (ex. Amazon). Please review the information below on how to access your cart to purchase the hard copy book (optional) and also tutorials on how to find and use the library e-books required for your course.

Bookstore information & how to validate your cart

- How to validate your cart – video demonstration
- How to validate your cart – bookstore information

How to find e-books in the APUS Online Library

- Getting Started in the Online Library – Video Virtual Tour
- I'm new to the APUS Online Library. Where should I start?
- I'm trying to find a specific e-book. How can I find it in the online library?

NOTE: Required library e-books for your course are available in the Books & E-books catalog. They are also linked in the course E-Reserve. From here, slowly start typing your course number and select it when it appears in a drop down menu. Information included here (and below) outlines download and print options for offline reading.

Library E-book Vendors – Print/Download Options

The following are providers of library e-books. Access, download, and print options for each may vary.

- **EBSCO** (aka Netlibrary): Available to read online or download. Full-text downloads available through Adobe Digital Editions. Download will expire after set number of days, but you may download as many times as you wish. Printing may be limited.
- **Ebrary**: Full-text downloads available through Adobe Digital Editions. Download will expire after a set number of days, but you may download as many times as you wish. Printing and a pdf download are also available for offline viewing, but may be limited to a specific number of pages. Once page max is reached, sign out in the top right hand corner to reset the page count.
- **EBL**: Available to read online or download. Full-text downloads available through Adobe Digital Editions. Download will expire after set number of days, but you may download as many times as you wish. Printing may be limited.
- **CRCNetbase** - You can view, download and print these e-books at the chapter level.
- **Safari** - you can read directly online and print one page at a time.
- ***MyiLibrary*—**you can read directly online. Note, printing is one page at a time and, depending on number of users at any one time, you may be locked out.
- ***Books 24x7*—**you can read directly online and print one page at a time.

Websites

Site Name- Institute of Electrical & Electronics Engineers - Microwave Theory & Techniques Society

Website URL/Address- http://www.mtt.org/

Site Name- Microwaves101.com

Website URL/Address- http://www.microwaves101.com/

Course Guidelines

Citation and Reference Style

- Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

Tutoring

- Tutor.com offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours* of tutoring provided

by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

Late Assignments

- Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. The due date for each assignment is listed under each Assignment.
- Generally speaking, late work may result in a deduction up to 15% of the grade for each day late, not to exceed 5 days.
- As a working adult I know your time is limited and often out of your control. Faculty may be more flexible if they know ahead of time of any potential late assignments.

Turn It In

- Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

Academic Dishonesty

- Academic Dishonesty incorporates more than plagiarism, which is using the work of others without citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

Submission Guidelines

- Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

Disclaimer Statement

- Course content may vary from the outline to meet the needs of this particular group.

Communicating on the Forum

- Forums are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the forum. The purpose of the forums is to actively participate in an on-going discussion about the assigned content.
- “Substantive” means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says “I agree” is not substantive. A substantive comment contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or illustration of a key point, points out an inconsistency in an argument, etc.
- As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.

Identity Verification & Live Proctoring

- Faculty may require students to provide proof of identity when submitting assignments or completing assessments in this course. Verification may be in the form of a photograph and/or video of the student's face together with a valid photo ID, depending on the assignment format.
- Faculty may require live proctoring when completing assessments in this course. Proctoring may include identity verification and continuous monitoring of the student by webcam and microphone during testing.

University Policies

Student Handbook

- Drop/Withdrawal policy
- Extension Requests
- Academic Probation
- Appeals
- Disability Accommodations

The mission of American Public University System is to provide high quality higher education with emphasis on educating the nation's military and public service communities by offering respected, relevant, accessible, affordable, and student-focused online programs that prepare students for service and leadership in a diverse, global society.