

**ELEC 167 Course Outline as of Fall 2020****CATALOG INFORMATION**

Dept and Nbr: ELEC 167 Title: RF COMMUNICATIONS

Full Title: Radio Frequency and Wireless Communications

Last Reviewed: 3/9/2020

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	2.00	17.5	Lecture Scheduled	35.00
Minimum	3.00	Lab Scheduled	3.00	8	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	5.00		Contact Total	87.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 70.00

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade Only

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly: ELEC 67A

**Catalog Description:**

An introductory course in theory and practice of radio frequency and wireless communication technologies.

**Prerequisites/Corequisites:**

Course Completion of ELEC 54B

**Recommended Preparation:****Limits on Enrollment:****Schedule of Classes Information:**

Description: An introductory course in theory and practice of radio frequency and wireless communication technologies. (Grade Only)

Prerequisites/Corequisites: Course Completion of ELEC 54B

Recommended:

Limits on Enrollment:

Transfer Credit:

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

<b>AS Degree:</b>	<b>Area</b>	<b>Effective:</b>	<b>Inactive:</b>
<b>CSU GE:</b>	<b>Transfer Area</b>	<b>Effective:</b>	<b>Inactive:</b>
<b>IGETC:</b>	<b>Transfer Area</b>	<b>Effective:</b>	<b>Inactive:</b>
<b>CSU Transfer:</b>		<b>Effective:</b>	<b>Inactive:</b>
<b>UC Transfer:</b>		<b>Effective:</b>	<b>Inactive:</b>

**CID:**

**Certificate/Major Applicable:**

Both Certificate and Major Applicable

## **COURSE CONTENT**

### **Student Learning Outcomes:**

At the conclusion of this course, the student should be able to:

1. Describe the various modulation techniques used in two-way and point-to-point microwave communications
2. Describe the function of key circuits used in radio frequency (RF) transmitters and receivers
3. Evaluate transmission signals, transmission lines, and antennas
4. Utilize network antenna analyzer for performance sweeps of antennas and transmission lines

### **Objectives:**

At the conclusion of this course, the student should be able to:

1. Construct and analyze fundamental circuits used in RF communication devices
2. Perform measurements of various radio parameters such as deviation, carrier frequency, receive sensitivity, forward and reflected power
3. Assemble coaxial connectors onto braided and heliax cable types
4. Assemble ethernet cables and perform microwave dish alignments
5. Test and identify common faults within coaxial cables and antennas
6. Identify and operate common test equipment used in communications system

### **Topics and Scope:**

#### **I. Fundamentals of Communications**

- A. Understanding of decibels in gain and attenuation
- B. Tuned circuits
- C. Filters
- D. Phase Locked Loop
- E. Fourier theory
- F. Wavelength and critical cable length

#### **II. Modulation Fundamentals**

- A. Amplitude modulation (AM)
  1. Modulation index
  2. Single sideband modulation
- B. Frequency modulation (FM)

1. Phase modulation
2. Modulation index and sidebands
- C. Digital modulation (DM)
  1. Digital coding
  2. FSK, QPSK, QAM
  3. FDMA, TDMA, CDMA
- III. RF Propagation and Path Analyses - Antennas Systems
  - A. RF wave propagation
  - B. Common antenna types and patterns
  - C. Microwave and waveguide systems
  - D. Transmission lines and connector types
  - E. Construction and best practices to installation
  - F. Performance testing

**Laboratory Material:**

- I. Crystal filters
- II. AM modulation and demodulation
- III. Differential modulator
- IV. FM modulation and demodulation
- V. Phase Locked Loop
- VI. Class C amplifier and RF mixers
- VII. Transmission lines and connectors
- VIII. Cable loss, distance to fault measurements
- IX. Complex load measurements
- X. Radio performance and FCC testing

**Assignment:**

**Lecture-Related Assignments:**

1. Assigned readings (20-30 pages per week)
2. Homework: collect, analyze, and validate data against spec sheets and by calculations (1-2 per week)
3. Quizzes (2-4); exam(s) (0-2)
4. Final exam

**Lab-Related Assignments:**

1. Weekly lab participation
2. Write lab reports (8-14)
3. Skill demonstration(s) (1-2)

**Methods of Evaluation/Basis of Grade:**

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Lab Reports
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Writing 20 - 30%
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**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework

Problem solving  
30 - 40%

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Skill demonstration(s)

Skill Demonstrations  
10 - 20%

**Exams:** All forms of formal testing, other than skill performance exams.

Quizzes, 0 -2 exam(s), final exam

Exams  
20 - 30%

**Other:** Includes any assessment tools that do not logically fit into the above categories.

Lab participation

Other Category  
0 - 10%

**Representative Textbooks and Materials:**

Principles of Electronic Communications Systems. 4th ed. Frenzel Jr, Louis. McGraw Hill. 2015 (classic)

Experiments Manual for Principles of Electronic Communications Systems. 4th ed. Frenzel Jr, Louis. McGraw Hill. 2015 (classic)