

ITT Technical Institute

ET2530

Electronic Communications

Onsite and Online Course

SYLLABUS

Credit hours: 4.5


Contact/Instructional hours: 56 (34 Theory Hours, 22 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisites: ET1410 Integrated Circuits or equivalent, ET1220 Digital Fundamentals or equivalent, MA1310 College Mathematics II or equivalent

Course Description:

In this course, students explore topics of electronic communications, such as the electromagnetic frequency spectrum, frequency bands, modulation, digital data, antennas, transmission lines and loads, government services and fiber optics. Exercises include diagramming modern transmitter and receiver components, plotting impedances, and making line and load conversions.



COURSE SUMMARY

COURSE DESCRIPTION

In this course, students explore topics of electronic communications, such as the electromagnetic frequency spectrum, frequency bands, modulation, digital data, antennas, transmission lines and loads, government services and fiber optics. Exercises include diagramming modern transmitter and receiver components, plotting impedances, and making line and load conversions.

MAJOR INSTRUCTIONAL AREAS

1. Introductory topics
2. Amplitude modulation
3. Single-sideband communications
4. Frequency modulation
5. Digital coding techniques
6. Digital communications concepts
7. Transmission lines
8. Wave propagation
9. Antennas
10. Microwave
11. Fiber optics and lasers

COURSE LEARNING OBJECTIVES

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

1. Describe the basic concepts and principles of electronic communications systems.
2. Apply analog modulation techniques to combine analog intelligence with a carrier for transmission.
3. Apply digital modulation techniques to combine digital intelligence with a carrier for transmission.
4. Apply multiplexing techniques to transfer information from one communication system to another.

5. Compare the different transmission media used to transfer information between communication systems.
6. Evaluate the performance of modern communications systems.

COURSE OUTLINE

MODULE 1: INTRODUCTION TO ELECTRONIC COMMUNICATIONS

COURSE LEARNING OBJECTIVES COVERED

- Describe the basic concepts and principles of electronic communications systems.
- Apply analog modulation techniques to combine analog intelligence with a carrier for transmission.

TOPICS COVERED

- The Decibel in Communications Work
- Information and Bandwidth
- Noise
- Amplitude Modulation
- Double-Sideband AM
- Suppressed Carrier and Single-Sideband AM

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Beasley, Hymer, & Miller, Chapters 1 and 2	No	6.5 hours
Lesson: Study the lesson for this module.	No	1.5 hours
Discussion: Participate in the discussion titled “Limitations Impacting Performance of a Communications System.”	Yes	N/A
Lab: Complete the lab titled “Decibel Measurements in Communications.”	Yes	N/A
Project: Read and begin the project.	No	1 hour

Total Out-Of-Class Activities: 9 Hours

MODULE 2: ANGLE MODULATION

COURSE LEARNING OBJECTIVES COVERED

- Apply analog modulation techniques to combine analog intelligence with a carrier for transmission.

TOPICS COVERED

- Angle, Frequency, and Phase Modulation
- Amplifiers and Oscillators
- Frequency-Selective Circuits
- The Phase-Locked Loop and Frequency Synthesis
- Transmitters and Receivers
- Demodulation and Detectors
- Automatic Gain Control and Squelch

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Beasley, Hymer, & Miller, Chapters 3, 4, 5, and 6	No	16 hours
Lesson: Study the lesson for this module.	No	1.5 hours
Exercise 1: Submit the exercise titled “Frequency Modulation.”	Yes	1 hour
Exercise 2: Submit the exercise titled “Demodulation and Detectors.”	Yes	1.5 hours
Lab 1: Complete the lab titled “Radio-Frequency Amplifiers and Frequency Multipliers.”	Yes	N/A
Lab 2: Complete the lab titled “FM Detection and Frequency Synthesis Using PLLs.”	Yes	N/A
Project: Continue work on Project Part 1.	No	2 hours

Total Out-Of-Class Activities: 22 Hours

MODULE 3: DIGITAL MODULATION TECHNIQUES

COURSE LEARNING OBJECTIVES COVERED

- Apply digital modulation techniques to combine digital intelligence with a carrier for transmission.
- Apply multiplexing techniques to transfer information from one communication system to another.

TOPICS COVERED

- Pulse Modulation and Multiplexing
- Pulse Code Modulation
- Coding Principles
- Code Error Detection and Correction
- Digital Signal Processing
- Digital Modulation Techniques
- Bandwidth Considerations of Modulated Signals
- M-Ary Modulation Techniques
- Spectral Efficiencies, Noise Performance, and Filtering
- The Complex Exponential and Analytical Signal
- Wideband Modulation

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Beasley, Hymer, & Miller, Chapters 7 and 8	No	10.5 hours
Lesson: Study the lesson for this module.	No	1.5 hours
Discussion: Participate in the discussion titled “Multiplexing Techniques.”	Yes	1 hour
Exercise: Submit the exercise titled “Wideband Modulation.”	Yes	1 hour
Lab: Complete the lab titled “Pulse-Width Modulation and Detection.”	Yes	N/A
Project: Submit Project Part 1.	Yes	8 hours

Total Out-Of-Class Activities: 22 Hours

MODULE 4: TRANSMISSION TECHNIQUES

COURSE LEARNING OBJECTIVES COVERED

- Compare the different transmission media used to transfer information between communication systems.

TOPICS COVERED

- Wireless Communication Networks
- Wireless Security
- Types of Transmission Lines
- The Smith Chart
- Transmission Line Applications
- Electromagnetic Waves
- Satellite Communications
- Types of Antennas
- Comparison of Transmission Systems
- Types of Waveguides

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Beasley, Hymer, & Miller, Chapters 10, 12, 13, 14, and 15 (pp. 536–550)	No	12 hours
Lesson: Study the lesson for this module.	No	2 hours
Exercise 1: Submit the exercise titled “Transmission Lines.”	Yes	1 hour
Exercise 2: Submit the exercise titled “Satellite Communications.”	Yes	1 hour
Lab 1: Complete the lab titled “Smith Chart Measurements.”	Yes	N/A
Lab 2: Complete the lab titled “Multisim Impedance Matching.”	Yes	N/A
Project: Begin work on Project Part 2.	No	2 hours

Total Out-Of-Class Activities: 18 Hours

MODULE 5: TELEPHONE NETWORKS AND THE INTERNET

COURSE LEARNING OBJECTIVES COVERED

- Evaluate the performance of modern communications systems.

TOPICS COVERED

- Basic Telephone Operation
- Digital Wired Networks
- The T-Carrier System and Multiplexing
- Packet-Switched Networks
- Alphanumeric Codes
- Computer Communication
- Local-Area Networks
- Internet
- IP Telephony
- Interfacing the Networks

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Beasley, Hymer, & Miller, Chapters 9 and 11	No	7 hours
Lesson: Study the lesson for this module.	No	1.5 hours
Discussion: Participate in the discussion titled “Troubleshooting Telephone Networks.”	Yes	1 hour
Exercise: Submit the exercise titled “Assembling a LAN.”	Yes	1 hour
Lab: Complete the lab titled “Pulse-Amplitude Modulation or Time-Division Multiplexing.”	Yes	N/A
Project: Continue work on Project Part 2.	No	6 hours
Final Exam: Prepare for the final exam.	No	4 hours

Total Out-Of-Class Activities: 20.5 Hours

MODULE 6: MODERN COMMUNICATIONS SYSTEMS

COURSE LEARNING OBJECTIVES COVERED

- Describe the basic concepts and principles of electronic communications systems.
- Apply analog modulation techniques to combine analog intelligence with a carrier for transmission.
- Apply digital modulation techniques to combine digital intelligence with a carrier for transmission.
- Apply multiplexing techniques to transfer information from one communication system to another.
- Compare the different transmission media used to transfer information between communication systems.
- Evaluate the performance of modern communications systems.

TOPICS COVERED

- Radar
- Optical Fibers
- Optical Networking

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Beasley, Hymer, & Miller, Chapter 15 (pp. 550–555) and Chapter 16	No	6 hours
Lesson: Study the lesson for this module.	No	1 hour
Project: Submit Project Part 2.	Yes	3 hours
Final Exam: Take the final exam.	Yes	N/A

Total Out-Of-Class Activities: 10 Hours

EVALUATION AND GRADING

EVALUATION CRITERIA

The graded assignments will be evaluated using the following weighted categories:

CATEGORY	WEIGHT
Lab	25%
Project	20%
Discussion	10%
Final Exam	20%
Exercise	25%
TOTAL	100%

GRADE CONVERSION

The final grades will be calculated from the percentages earned in the course, as follows:

GRADE	PERCENTAGE
A (4.0)	90–100%
B+ (3.5)	85–89%
B (3.0)	80–84%
C+ (2.5)	75–79%
C (2.0)	70–74%
D+ (1.5)	65–69%
D (1.0)	60–64%

)	
F (0.0)	<60%

REQUIRED RESOURCES

COMPLETE TEXTBOOK PACKAGE

- Beasley, J., Hymer, J., & Miller, G. (2014). *Electronic communications: A system approach*. Upper Saddle River, NJ: Prentice Hall.
- Beasley, J., Miller, G., Hymer, J., Oliver, M., & Shores, D. (2014). *Laboratory manual to accompany electronic communications: A system approach*. Upper Saddle River, NJ: Prentice Hall.

OTHER ITEMS

- Electronics Student Kit

RECOMMENDED RESOURCES

- Professional Associations
 - Consumer Electronics Association(CEA): <http://www.ce.org/>
 - Electronics Technicians Association (ETA): <http://www.eta-i.org/>
 - Telecommunications Industry Association (TIA): <http://www.tiaonline.org/>
- ITT Tech Virtual Library (accessed via Student Portal | <https://studentportal.itt-tech.edu>)
 - School of Study> School of Electronics Technology> Recommended links>
 - Certification>
 - ◆ ETA Certifications <http://www.eta-i.org/index.html>
 - Circuits>
 - ◆ Circuit Exchange International <http://www.zen22142.zen.co.uk/>
 - ◆ Delabs Electronic Circuits <http://www.delabs-circuits.com/>
 - Standards>
 - ◆ National Institute of Standards and Technology <http://www.nist.gov/>
 - ◆ Telecommunications Industry Association (TIA) Standards <http://www.tiaonline.org/>
 - School of Study> School of Electronics Technology> Databases>
 - Books24x7>

- ♦ Laino, J. (2002). *The telecom handbook: understanding business telecommunications systems & services (4th ed.)*. New York, NY: CMP Books.
- ♦ Muller, N.J. (1998). *Mobile telecommunications factbook*. New York, NY: McGraw-Hill.
- ♦ Muller, N.J. (2000). *Desktop encyclopedia of telecommunications (2nd ed.)*. New York, NY: McGraw-Hill.
- Other References
 - Communications-Electronics Fundamentals
http://www.cbtricks.com/miscellaneous/tech_publications/neets/tc9_64.pdf
This manual provides information about wave propagation, transmission lines, and antennas.
 - FCC Web site
<http://www.fcc.gov>
This is the Web site of Federal Communications Commission. This Website contains FCC working papers.
 - Light, Laungston College Physics
<http://www.launc.tased.edu.au/online/sciences/physics/lightwavepart.html>
This Web site covers various wave and particle characteristics of light.
 - Standing Waves, Laungston College Physics
<http://www.launc.tased.edu.au/online/sciences/physics/standing.html>
This Web site illustrates interference due to standing waves.
 - Tuning a Receiver, Molecular Expressions
<http://micro.magnet.fsu.edu/electromag/java/radio/index.html>
This Web site provides the illustration of tuning radio receiver using adjustable capacitor.

○

INSTRUCTIONAL METHODS AND TEACHING STRATEGIES

The curriculum employs a variety of instructional methods that support the course objectives while fostering higher cognitive skills. These methods are designed to encourage and engage you in the learning process in order to maximize learning opportunities. The instructional methods include but are not limited to lectures, collaborative learning options, use of technology, and hands-on activities.

To implement the above-mentioned instructional methods, this course uses several teaching strategies, such as hands-on labs, exercises, and discussions. Your progress will be regularly assessed through a variety of assessment tools including discussions, exercises, labs, project, and a final exam.

OUT-OF-CLASS WORK

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded for coursework in this program course (including out-of-class assignments and learning activities described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

ACADEMIC INTEGRITY

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct. For more information on the academic honesty policies, refer to the Student Handbook and the School Catalog.

INSTRUCTOR DETAILS

Instructor Name	
Office Hours	
Contact Details	

(End of Syllabus)