

ELEN420 16

STUDENT WARNING: This course syllabus is from a previous semester archive and serves only as a preparatory reference. Please use this syllabus as a reference only until the professor opens the classroom and you have access to the updated course syllabus. Please do NOT purchase any books or start any work based on this syllabus; this syllabus may NOT be the one that your individual instructor uses for a course that has not yet started. If you need to verify course textbooks, please refer to the online course description through your student portal. This syllabus is proprietary material of APUS.

Course Summary

Course : ELEN420 **Title :** Communication Systems

Length of Course : 16

Prerequisites : ELEN325, MATH302, MATH328, ELEN310 **Credit Hours :** 3

Description

Course Description: The course covers statistical communication theory including amplitude, frequency, and pulse code modulation; description of random process by auto-correlation and power spectral density functions, sources and properties of electrical noise and its effect on communication systems, the effects of modulation, detection and filtering on signal information content, and bandwidth and signal-to-noise ratio. Topics include: a review of signals and systems, power spectral density, amplitude modulation, angle modulation, pulse modulation, a review of probability and random variables, and an introduction to digital transmission systems. 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, ELEN325 AND MATH302 OR MATH328)

Course Scope:

The course covers the fundamentals of communication signals, and techniques to transmit and receive signals in a communication system. The course starts with the theory of signals in time and frequency domains, and the transmission of such signals through communication channels. It then introduces the various types of modulations and demodulations. The concept of sampling and the conversion of analog signals into digital signals is then presented. The principles of digital data transmission are then presented. Fundamentals of probability theory and random signals and noise are covered. The spread spectrum techniques and their application to real-life communication systems are described. The course concludes with the performance analysis of signal transmission in noisy channels, and the principles of statistical communications.

Students will perform a set of Matlab projects to strengthen understanding of communication concepts.

Objectives

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

1. Discuss the characteristics of signals in time and frequency domains.
2. Evaluate different modulation and demodulation techniques.
3. Explain sampling and signal conversion from analog to digital.

4. Analyze the characteristics of digital data transmission.
 5. Apply probability and random processes to communication signals and systems.
 6. Analyze the performance of signal transmission in channels corrupted with noise.
 7. Describe spread spectrum techniques and their use in practical systems.
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Outline

Week 1: Introduction to communication systems and signals

Learning Objective(s)

LO1

Readings

Chapter 1

Assignment(s)

Week 1 forum

Week 1 assignment

Week 2: Signals and signal space

Learning Objective(s)

LO1

Readings

Chapter 2

(pp. 20-34)

Assignment(s)

Week 2 forum

Week 2 assignment

Week 2 quiz

Week 3: Signals and systems

Learning Objective(s)

LO1

Readings

Chapter 2

(pp. 34-69)

Assignment(s)

Week 3 forum

Week 3 Matlab project

Week 4: Analysis and Transmission of Signals

Learning Objective(s)

LO4

Readings

Chapter 3 (pp. 91-123)

Assignment(s)

Week 4 forum

Week 4 assignment

Week 4 quiz

Week 5: Analysis and Transmission of Signals

Learning Objective(s)

LO4

Readings

Chapter 3 (pp. 123-155)

Assignment(s)

Week 5 forum

Week 5 assignment

Week 6: Amplitude Modulations and Demodulations

Learning Objective(s)

LO2

Readings

Chapter 4 (pp. 178-210)

Assignment(s)

Week 6 forum

Week 6 quiz

Week 6 Matlab project

Week 7: Amplitude Modulations and Demodulations

Learning Objective(s)

LO2

Readings

Chapter 4 (pp. 210-230)

Assignment(s)

Week 7 forum

Week 7 assignment

Week 8: Angle Modulation and Demodulation

Learning Objective(s)

LO2

Readings

Chapter 5 (pp. 252-284)

Assignment(s)

Week 8 forum

Week 8 assignment

Week 8 quiz

Week 9: Angle Modulation and Demodulation

Learning Objective(s)

LO2

Readings

Chapter 5 (pp. 284-292)

Assignment(s)

Week 9 forum

Week 9 Matlab project

Week 10: Sampling and Analog-to-Digital Conversion

Learning Objective(s)

LO3

Readings

Chapter 6 (pp. 302-340)

Assignment(s)

Week 10 forum

Week 10 assignment

Week 10 quiz

Week 11: Sampling and Analog-to-Digital Conversion

Learning Objective(s)

LO3

Readings

Chapter 6 (340-361)

Assignment(s)

Week 11 forum

Week 11 assignment

Week 12: Principles of Digital Data Transmission

Learning Objective(s)

LO4, LO5, LO6

Readings

Chapter 7 (pp. 377-408)

Assignment(s)

Week 12 forum

Week 12 quiz

Week 12 assignment

Week 13: Principles of Digital Data Transmission

Learning Objective(s)

LO4, LO5, LO6

Readings

Chapter 7 (pp. 409-437)

Assignment(s)

Week 13 forum

Week 13 assignment

Week 14: Fundamentals of Probability Theory and Random Processes

Learning Objective(s)

LO5, LO6

Readings

Chapter 8 (pp. 447-481; 497-502)

Assignment(s)

Week 14 quiz

Week 14 Matlab project

Week 15: Spread Spectrum Communications

Learning Objective(s)

LO7

Readings

Chapter 12 (pp. 714-730)

Assignment(s)

Week 15 forum

Week 15 assignment

Week 16: Spread Spectrum Communications

Learning Objective(s)

LO7

Readings

Chapter 12 (pp. 730-751)

Assignment(s)

Week 16 assignment

Week 16 quiz

Evaluation

Instructor announcements: Weekly announcements will appear on Monday of each week in the online classroom. The announcement will discuss the assignments for the week along with 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 will be based on your participation in the forums (24% of your total grade), twelve

assignments (30% of your grade), four Matlab projects (30% of your grade) and 8 quizzes (16% of your grade).

Reading Assignments: Please refer to the Course Outline section of this syllabus for the weekly reading assignments.

Week 1 Self-introductions: During Week 1 forum, each student must post a self-introduction (bio) to the class. This self-introduction is a requirement by the University, and is due by mid-night of Sunday of Week 1. Your response must be 250-300 words (a requirement) and include the following information.

- a. Your name
- b. Your university major or program
- c. Where you are in the program of study
- d. Your academic goals, to include why you are taking this class
- e. Information that you would like to share about yourself

Weekly Forums: There will be sixteen weekly forums (1.5% each), counting 24% of the final grade. The forums will consist of specific questions to be answered, broad questions to be discussed, or polls for students to post their questions on the topics covered in that week. In each forum, a student is required to contribute an initial post (1%), and at least replies to classmates (0.5%).

Weekly Assignments: There will be twelve weekly assignments (2.5% each) during the course worth a total of 30% of the total grade. Each assignment will typically cover one chapter in the textbook. For all problems requiring mathematical calculations, all work must be shown.

Quizzes: There will be eight timed quizzes (2% each), counting 16% of the final grade. Quizzes will be open book, and open note. Quizzes will be timed, and non-proctored. Students must complete each quiz within its time limit.

Matlab projects: There will be four project-assignments using Matlab (7.5% each), counting 30% of the final grade.

Grading:

Name	Grade %
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Materials

Book Title: Modern Digital and Analog Communication Systems, 4th edition

Author: Lathi

Publication Info: Oxford University Press

ISBN: 9780195331455

Book Title: MATLAB and Simulink Student Suite-Not covered by the APUS Grant - available to purchase at https://www.mathworks.com/store/link/products/student/SV?s_tid=ac_buy_sv_but1_2

Author:

Publication Info:

ISBN: NTMO

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

Author: National Instruments

Publication Info: National Instruments

ISBN: 779252-3501

Book Title: Additional required items are available to order from the APUS Bookstore. If you buy these items from other vendors, you may not receive all the parts you need for your course. These items (as noted) are not covered by the APUS Book Grant.

Author: N/A

Publication Info: N/A

ISBN: N/A

Book Title: You must validate your cart to get access to your hard copy materials. If needed, instructions are available here - <http://apus.libguides.com/bookstore/undergraduate>

Author: N/A

Publication Info: N/A

ISBN: N/A

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.

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