Sonoma State University
Engineering Science
Course Syllabus – Fall 2014

Course: CES 540**: Digital Communications**
Lecture: Salazar 2009A

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Office Hours: See the web site please – I am not available on Fridays.

Textbooks: (*)
- Required: "Digital and Analog Communication Systems", 7th Edition, L. Couch, Prentice Hall, 2007, ISBN-13: 9780131424920. / 8th Edition. NOTE: the eTxtbook is available as well. Note: eBooks are available from the Library
- Schaum's Outline of Analog and Digital Communications

References:
- "Introduction to analog and Digital Communications", S. Haykin & M. Moher, 2 ed., John Wiley & Son, 2007, ISBN: 978-0-471-43222-7.
- "Communication System", S. Haykin, 4 0-471-17869-1.
- "Analog and Digital Communications", Hwei HSU, 2 Outline, McGraw-Hill, 2003, ISBN 0-07-140228-4.
- "Analog and Digital Communications", Martin & Roden, 5 2003, ISBN: 0964696975.
- "Digital Communication Systems Fundamentals and Applications", Bernard Sklar, Prentice Hall, 1987, ISBN: 0132119390.

Required Material: Matlab software & some small electrical components

Prerequisites: ES 400: Signals and Systems
ES 230: Electronics I

Grading Plan:
(See Note 1)

Exams	35%
Lab	25%
Assignments / Quiz / Articles	35%
Final Project	5%

Grading:

95 - 100 A	70 – 73 C-
90 – 93 A-	77 – 79 C+
87 – 89 B+	67 – 69 D+
84 – 86 B	64 – 66 D
80 – 83 B-	60 – 63 D-
74 – 76 C	< 60 F

Reminder:
ES 442 is a 4 credit hour course requiring an average of 12 hours of study per week!

(*) Please note that I will be using the 8th Edition.

Note 1:
- 15 points deduction / day for each late assignment / Incomplete programs are not accepted.
- For each unexcused absence in the lab your *final* grade will be dropped by *three* points.

Course outline
Chapter 1 - Historical Perspective, Digital and Analog Sources and Systems, Deterministic and Random Waveforms, Block Diagram of a Communication System, Frequency Allocations, Propagation of Electromagnetic Waves, Channel Capacity and Ideal Communication Systems
Chapter 2 - Properties of Signals and Noise, Fourier Transform and Spectra, Power Spectral Density and Autocorrelation Function, Orthogonal Series Representation of Signals and Noise, Fourier Series, Review of Linear Systems, Bandlimited Signals and Noise, Discrete Fourier Transform, Bandwidth of Signals
Tools and Software • *Matlab:* *http://www.mathworks.com/*

POLICIES

CLASSROOM CONDUCTS: In order to create an appropriate environment for teaching and learning, students must show respect for their instructor and fellow students. Listed below are a few guidelines for classroom behavior. Students are expected to follow these rules to ensure that the learning environment is not compromised.

1. **Class Participation**: You are expected to be in class the entire class time. Please <u>do not</u> enter late or leave early. Rare exceptions may be made, particularly in emergency situations. Your participation in the class and lab and the discussions are very important and would help me understand how much you follow the material. As you go through the material before and after the class jot down your questions and ask me as I go through the slides.
2. **Absences**: Inform the instructor in advance, if you know you are going to miss a class. Also, take responsibility for getting missed assignments from other students. Your instructor is not responsible for re-teaching the material you missed due to an absence or being late.
3. **Conversation**: Do not carry on side conversations in class.
4. **Sleep**: Do not sleep in class.
5. **Internet browsing**: Please turn off all monitors/laptops and listen to lectures. Check your emails before coming to class!
6. **Attitude:** You are expected to maintain a civil attitude in class. You may not use inappropriate or offensive commentary or body language toward the instructor or fellow students.
7. **Cell phones:** You may not use your cell phone during class. Please turn off your cell phone upon entering the classroom.

PLAGIARISM: All forms of cheating and plagiarism are serious offenses that can result in disciplinary penalties including expulsion from the university. This includes copying assignments from the Internet! Refer to the student handbook for details.

WITHDRAWAL: No student will be granted a withdrawal after the deadline unless under extreme circumstances. Policy regarding withdrawal is stated in the university catalog.

SPECIAL NEEDS: Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs.

COURSE OBJECTIVES

As an outcome of completing this course, students should be able to:

- Understand the fundamental roles of information and noise in communication systems
- Understand the properties of transmission media and channels
- Understand methods for time- and frequency- domain analysis of signals and systems encountered in communication systems
- Understand the relationship between analog communication and digital communication and reasons behind the increasing use of digital communications.
- Understand the need for both baseband communication systems and passband communication systems
- Understand the central role of the communication channel and its constraints: distortion, attenuation, bandwidth, and noise. . Understand modulation schemes for analog passband communication: AM, FM, PM, and variations
- Understand the representation of digital signals using binary and multilevel line codes.
- Understand modulation schemes for digital passband communication: PSK, FSK, QAM, and variations.
- Design communication systems to satisfy a wide range of engineering requirements
- Understand how to use computer-based simulation and analysis tools to design communication systems
- Understand and evaluate new communication technologies
- Write reports on communication design projects
- Understand that the development of communication systems is not governed solely by technical or engineering considerations but also by broader issues such as standardization, government regulation, economics, and market forces.
- Assess the societal impact of communication systems and the engineer's responsibilities in this regard.
- Work in teams to solve communication design problems.

COURSE LEARNING OBJECTIVES (for ABET)

Contribution of Course to Meeting the Professional Component:
Engineering topics: 100%
Math & Basic Science: 0%
General Education: 0%

ABET Student Outcomes	Course Learning Objectives	Level of Support
(a) an ability to apply knowledge of mathematics, science, and engineering	B, F	5
(b) an ability to design and conduct experiments, as well as to analyze and interpret data	B, D, E, F	4
(c) an ability to design a system, component, or process to meet desired needs	B, E, F	3
(d) an ability to function on multi-disciplinary teams	G	2
(e) an ability to identify, formulate, and solve engineering problems	B, F	5
(f) an understanding of professional and ethical responsibility	C	2
(f) an understanding of professional and ethical responsibility	B, F	2
(g) an ability to communicate effectively	C	3
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context		3
(i) a recognition of the need for, and an ability to engage in life-long learning	A	4
(j) a knowledge of contemporary issues		4
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	E	4
(l) one or more technical specialties that meet the electronic-related needs of North Bay companies	A-E	5

A. Describe "engineering" and the fields of engineering and various choices you can make
B. Understand some basic electrical engineering concepts and terminologies
C. Understand what would be expected from you as an electrical engineer at the work place.
D. Expose to electrical engineering labs
E. Receive some hands-on experience with measurement equipment and tools in electrical engineering labs
F. Apply the basic engineering concepts in the lab
G. Work in teams in the lab in preparation for project designs

ASSIGNMENTS

HOMEWORK: All students are required to complete homework assignments. Homework assignments require familiarity with different software tools such as Excel, and VISIO. Homework assignments must be submitted in class. Late submissions will receive 15 deduction points for each late day, including weekends. All hardcopy submissions must be stapled and have a coversheet, otherwise they will *not* be accepted. Please avoid printing your homework when class starts! Unless specified in advance, no handwritten homework will be accepted.

DISCUSSION GROUP: Each individual student is required to have at least four entries into the class Piazza Discussion Group. Blog entries include answer to questions and responses to other students

DESIGN PROJECT: You are required to submit one final design project. All projects require prior approval from your instructor. Maximum of two people per group is allowed. Each must submit an abstract identifying its members (who is doing what), project idea, and objective of the project. It is **strongly** suggested that you take full advantage of your Spring Break to complete your project! Incomplete projects do **NOT** receive grades!

QUIZZES: There will be a quiz almost once a week (Wednesdays). The quizzes will be based on practice/homework problems (but not exactly the same). No make-ups are allowed. If you are late to class or stepped outside and missed a quiz, there will be no make-up. You can drop your lowest quiz grade. Note that all quizzes are limited to no longer than 10-15 minutes.

ARTICLES: Each individual student is required to have at least FOUR article summery entries into the class discussion group (Piazza). All articles must be from the designated magazines only. Each entry must describe the main point of the article/news along with proper citation. Four article submissions counts as one quiz grade.

EXAMS: Exams will consist of problems designed to test your understanding of the concepts covered in class and lab. Anyone missing an exam will receive a zero grade for that exam. Make-up exams will only be given with a doctor's slip stating that you were too ill on the day of the exam to attend, or documented extraordinary circumstances. Please note that exams may include in-class programing assignment. **NOTE:** In order to be able to take the final exam you are required to bring a snapshot of your Moodle indicating that you have completed the **class evaluations**. You will not be allowed to take the final exam if you do not bring a proof that you have completed the class evaluation.

LABS & PRE-LABS: Each student must submit a single lab report. Please note that for each unexcused absence in the lab your *final* grade will be dropped by three points. All pre-labs must be typed, dated, and include student's name and ID; you receive a zero otherwise. Pre-labs are ½ of the overall lab grades.

LECTURE SERIES: All students are highly encouraged to attend the sector series.

LABORATORY GUIDELINES

Basic Rules:

- No eating, drinking, or smoking in the labs.
- A group of maximum two people will make a team. Lab reports must be prepared individually.
- There is no credit for any missing lab sessions.
- You have to clean up the workstation after you finish your lab session. All equipment should be placed just as before your use. All parts should be in as original shape as possible and placed in the right place (Make sure you straighten up all the wires and legs of parts using pliers so that next group of students won't have problem with parts).

Procedural Routine:

SOFTWARE

All students are expected to become skilled and comfortable with the following software: MS Word, MS Excel, and PowerPoint. You are also required to down load and install the following software tools to complete your assignments:

- MS VISIO
- Matlab http://www.mathworks.com/
- SystemVue (Video Tutorials)

GENERAL GUIDELINES

- Quizzes on Mondays; almost every week!
- Labs on Wednesdays
- Lab assignments can be hands-on or simulation based
- Assignments and quizzes are all bundled together

GRADING SUMMARY

Each student's final grade will be calculated according to the Grading Plan mentioned above. Please note the following:

1. All assignments must be submitted at the beginning of the class. They must be stapled and have a coversheet.
2. Late assignments (hardcopy or softcopy), including lab, pre-lab, homework, etc., will receive 15 deduction points for each late day, including weekends.
3. There will be no curving (89.2 is still a B$^+$).
4. There will be no make-ups.
5. Quizzes will be given at the beginning of each class.
6. Pay attention to the grading plan!
7. Incomplete projects do **NOT** receive grades!

Please make sure you speak to me before you decide on dropping the class!

I will be available, if you are willing to learn!