

EC 415 Communication Systems
Syllabus – Fall 2009
Prof. Jeff Carruthers

1 Logistics

Credits: 4.

Prerequisites: EC401 or equivalent.

1.1 Staff

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1.2 Lectures

The lectures are held in PHO Room 201. The lectures are scheduled for Mon/Wed from 2-4pm. Lectures will begin at 2:05pm and end at 3:45pm. There will be a ten-minute break starting at about 2:50pm

1.3 Textbooks and References

The course materials will serve as the textbook. They include

- lecture notes
- problem workbook and solutions
- lab exercises
- lab projects

A book on signals and systems such as

Signals and Systems, Oppenheim and Willsky,
with Nawab, 2nd ed. Prentice Hall

will also be helpful.

1.4 Web Site:

<http://blackboard.bu.edu>

2 Course Content

2.1 Goals:

To provide students with:

- Thorough understanding of the theories and analytical methods used in communication systems
- Experience with the elements of communication systems: transmitters, channels, and receivers.
- Understanding of the relationships between signals, modulation techniques, and channels.
- Knowledge of the design and operation of current communication systems.

2.2 Course Outcomes:

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

1. Understand the fundamental roles of information and noise in communication systems
2. Understand the properties of transmission media and channels
3. Understand methods for time- and frequency- domain analysis of signals and systems encountered in communication systems
4. Understand the relationship between analog communication and digital communication and reasons behind the increasing use of digital communications.
5. Understand the need for both baseband communication systems and passband communication systems
6. Understand the central role of the communication channel and its constraints: distortion, attenuation, bandwidth, noise.
7. Understand the wireless radio channel and how to design effective, reliable communication systems for this channel.
8. Understand modulation schemes for analog passband communication: AM, FM, PM, and variations
9. Understand the representation of digital signals using binary and multilevel line codes.
10. Understand modulation schemes for digital passband communication: PSK, FSK, QAM, and variations.
11. Design communication systems to satisfy a wide range of engineering requirements
12. Understand how to use computer-based simulation and analysis tools to design communication systems

13. Understand and evaluate new communication technologies
14. Write reports on communication design projects
15. 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.
16. Assess the societal impact of communication systems and the engineer's responsibilities in this regard.
17. Work in teams to solve communication design problems.

3 Evaluation and Grading Policies

3.1 Grading

The final course grade is out of 1000, and the letter grade will be determined as follows:

- approximately 800 or more: A- to A
- approximately 700-800: B- to B+
- approximately 600-700: C- to C+
- approximately 500-600: D
- approximately 499 or less: F

Your grade will be comprised of the following components:

Component	Total Points
Lab projects (5 projects x 60 points)	300
Quizzes (7 best x 50 points)	350
Final Exam	350
Total	1000

3.2 Policies

Any missing grades with an approved excuse will be calculated as $Y_i = \min(M_i, Y_i' \frac{X}{X'})$ where

- X is your total grade on all completed components,
- X' is the class average on those components you completed,
- Y_i' is the class average on component i , and
- Y_i is your "excused" grade on component i
- M_i is the value of component i

So, if you did 10% better than the class on your completed parts, you will be assigned a grade 10% better than the class on your excused parts.

Note: If 500 points or more are excused, an I grade will be assigned.

4 Course Components

4.1 Laboratory Projects

The laboratory projects require you to build a model of a communication system and test or analyse its operation or its performance. Some of the lab projects will use MATLAB as the development environment, some may use the MobileStudio development board.

- Four of the projects can be done individually or in groups of two, and one must be done individually. For some projects, additional components will be required by the groups of two. Groups of three or more are not allowed.
- Your grade will be based on a project report and a demonstration of the project to the instructor or teaching fellow.

4.2 Quizzes

There are 8 quizzes, which begin at 3:15pm on most Wednesdays starting on September 23. Your best seven results will count toward your final grade. Quizzes will mostly be closed notes, no calculators, no books; some may be MATLAB oriented. A formula sheet will be provided.

4.3 Final Exam

There will be a final exam in the regularly scheduled exam period, December 16-21, 2009. It will be closed notes, no calculators, no books.

A formula sheet will be provided.