Franklin W. Olin College of Engineering  
Needham, Massachusetts  
Electrical and Computer Engineering  

ENGR3420 Analog and Digital Communications  
Fall 2005  

Class Information  
Instructor: Jose Oscar Mur-Miranda (Previous class development by Bradley Minch and Gill Pratt)  
Times and location: TF 9am-9:50am and W 9-10:50am in AC304 (F 9am-9:50am is eliminated in place of the tutorials)  
Website: http://faculty.olin.edu/~jmurmiranda/courses.htm  
Class Folder: TBA  
Instructor e-mail: jomm@olin.edu  
Instructor telephone: (781)292-2544  

Objectives  
By the end of the course, the students should be able to:  
- Analyze, design and optimize amplitude, angular, pulse coding, m-ary, and pseudo-noise communications system using quantitative tools to optimize power, cost, bit rate, number of users, latency, and/or bandwidth as desired.  
- Abstract a communication system from any system where information is transferred in order to apply the same quantitative tools and design knowledge.  
- Design new communication systems which respond to future needs and employ other technologies.  

Outcomes  
By the end of the course, students should be able to:  
- Define the information contained in a message.  
- Calculate the entropy of a source as a measure of its average information output.  
- Find the minimal amount of bits necessary to encode a source imposed by its uncertainty.  
- Explain amplitude, angular, pulse coding, m-ary, and pseudo-noise modulation schemes.  
- Evaluate the immunity to noise of different modulation schemes.  
- Design different implementations of modulators and demodulators.  
- Describe the fundamental trade off between bandwidth and bit rate imposed by noise in a communications channel.  

Student Assessment  
- Students will be assessed at regular intervals using short oral exams. There will be at least three and at most five laboratories for which the student will be asked a written report to explain a given communication system, simulate its behavior, and measure the system behavior after building an implementation. For at least one of these laboratories, the students will be asked to design a different
implementation of the system, measure its behavior, and explain the observations using theory and simulation.

Competencies developed
- Qualitative and Quantitative Analysis, Design and Diagnosis will be extensively developed (5) through oral exams as well as through design and implementation laboratories.
- Teamwork will be somewhat developed (3) in the design and implementation laboratories to be done in pairs or triplets according to the system complexity.
- Communication will be somewhat developed (3) in the written laboratory reports and oral exams.

Competencies assessed (method of assessment)
- Qualitative Analysis (design and implementation laboratories, oral exams)
- Quantitative Analysis (design and implementation laboratories, oral exams)
- Teamwork (design and implementation laboratories)
- Communication (laboratory reports, oral exams)
- Design (design laboratories)
- Diagnosis (design and implementation laboratories)

Level of Achievement expected
- Given that the class is composed of juniors in ECE, and in light of the competencies developed, the level of achievement expected in quantitative and qualitative analysis, design and diagnosis is advanced. The level of achievement expected in teamwork and communication is intermediate since these are not the primary focus of the objectives of the class.

Classroom Assessment
- This course is currently under development. While the subject material is also covered in similar classes outside Olin, the delivery of the class will be based in the “do-learn” method typical of Olin classes. Thus, questions of scope and depth will be addressed in a continuing dialog between the instructor and the students. In particular, the instructor will meet with the students at regular intervals to administer short oral exams in order to find points where the material needs reinforcement. At these meetings, the students will also be able to provide feedback to the instructor regarding class pace, content and level of complexity.

References
  