EECS 562: Introduction to Communication Systems

Victor S. Frost
Dan F. Servey Distinguished Professor
Chair Electrical Engineering and Computer Science
University of Kansas
Phone: (785) 864-4486
e-mail: frost@ku.edu
http://www.ittc.ku.edu/~frost

Course Information

- Semester: Spring 2017
- Lecture: TR 09:30 -10:45 AM LEA 3152
- Discussion: Room 3152 Lea; Monday 5:00 - 07:00 PM will be used for test reviews, make up classes, and as needed homework reviews. **Will not meet every week; check class web site to find out if discussion session is meeting.**
- Text: Introduction to Analog & Digital Communications, 2nd Edition Simon Haykin and Michael Moher, Wiley, 2007

Course Information

Class Web Page:
http://www.ittc.ku.edu/~frost/EECS_562/index_EECS_562_Spring_2017.htm

Lab Web Site:
https://people.eecs.ku.edu/~jlialys/EECS562/
Lab GTA : Justinas Lialys jlialys@ku.edu
Labs start Week of Jan 23, 2017.
Lab schedule @ https://people.eecs.ku.edu/~jlialys/EECS562/EECS562_Lab_Schedule.pdf

Office hours and Contact Information:

- Time: 8:00-9:00 TR
- Place: 2001 Eaton Hall
- Other times by appointment
- Phone:
  - Eaton 864-4486
  - Nichols 864-4833
  - Home 841-3244
- e-mail: frost@ku.edu

Course deliverables

- Exams
- Homework: problems will be assigned & graded.
- Grading:
  - 2 - In class tests; (125 points/test) = 250 pts/test
  - Lab = 125 pts
  - Homework & Short Quizzes = 25 pts
  - Review Quiz = 15 pts
  - Final = 175 pts

    Final: Thursday, May 11: 7:30 - 10:00 am
- A short (approximately 30 minutes) quiz will be given near the beginning of the course to review signal analysis concepts from EECS 360.
- There maybe other unannounced quizzes at my discretion.
- General guidelines: Only under very extreme conditions will make up tests be given. No late homework will be accepted.

Initial Grading Scale

- 90 - 100 % A
- 80 - 89 % B
- 70 - 79 % C
- 60 - 69 % D
- 0 - 59 % F

Homework

- All homework assignments will be posted on the class web page
- Solution will not be posted, problems will be worked in class or during office hours upon request.
- Electronic submission of assignments is permitted.
- Electronic submissions must be in pdf format
- Electronic submissions must use this file naming format.
  - Homework: HW#_LastName.pdf
  - For example, HW5_Frost.pdf
- If you E-mail assignments, send them to the grader and cc me.
- Grader: Justinas Lialys jlialys@ku.edu

Homework Format

- All work containing more than one page must be stapled - no paper clips and no folded corners. In order to facilitate grading of homework problems, homework shall meet the following specifications:

  1. Hand written or typed single-sided on 8.5"x11" paper.

  2. If not typed then for text and equations, use an HB or No. 2 pencil (or darker), or blue or black ink. (Pencil is preferred.) No other colors please, except in diagrams or
  graphs.

  3. All pages should be numbered i/j in top right hand corner, with your name appearing at the top of each page. It is O.K. to use your initials after the first page.

  4. All work must be shown for full grade - be as thorough as possible.

  5. Writing should be legible and literate - if the grader cannot read your handwriting, you will receive no credit for the problem.

Homework Format

- 6. Answers are to be boxed and right justified, with the variables, values (if any) and units (if any), included in the box. Right justified means placed on the right side of the page.

  7. Leave half an inch between consecutive parts of a question, and draw a line across the page at the end of each complete question.

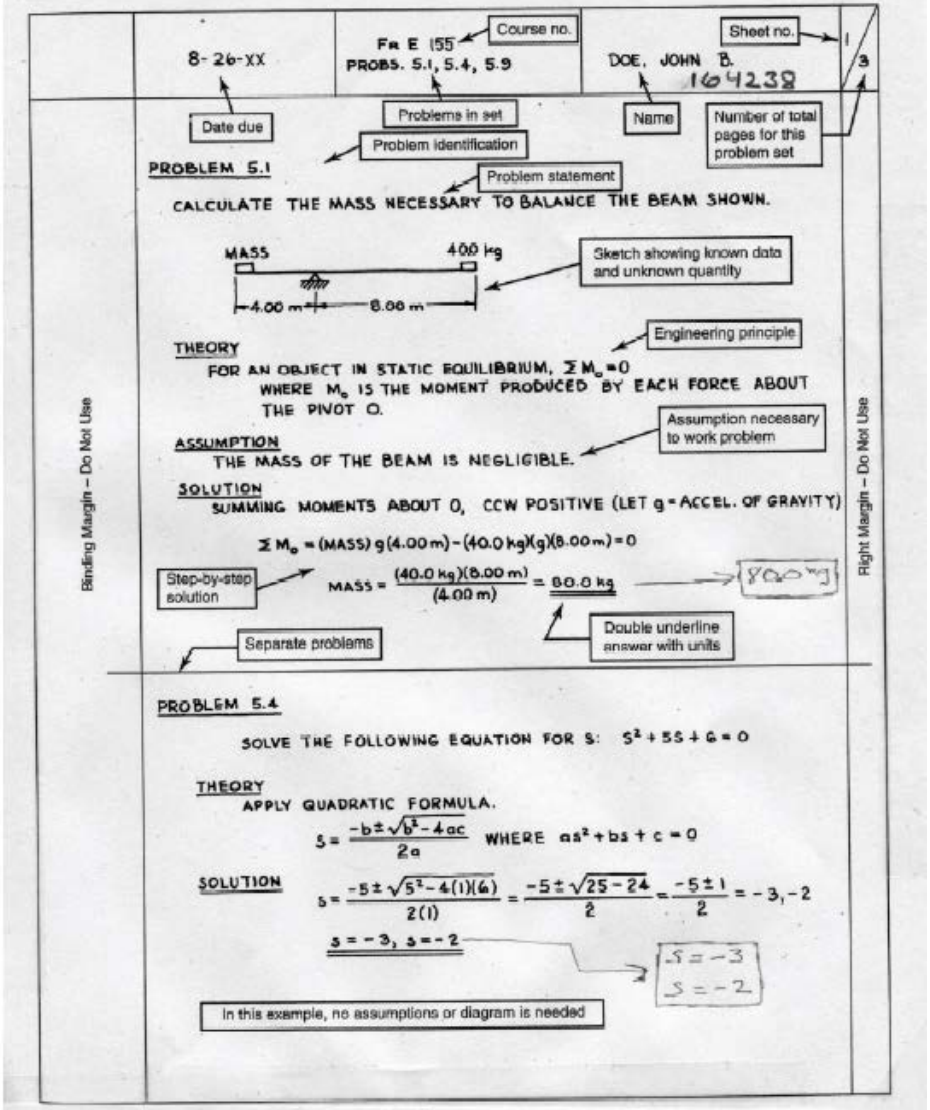
  8. No part of a question should appear in any margin of the paper.

  9. Diagrams and graphs should be of a good size (say at least 3x5 sq. inch), and may contain colors. Diagrams and graphs must be titled, labeled, and clearly drawn. Tables should also be titled.

  10. Graphs should be scaled (put number on axes), labeled (put names /units on axes), and titled at the bottom of the graph. Any graph which occupies an area of less than 3x5 sq. inch and which is not titled will not be graded.

  11. Where possible use conventional units such as bits/sec, Hz and km

Figure 3.1



From: Engineering: Fundamentals and Problem Solving, A. R. Eide, et. Al., McGraw Hill, Boston, 2002

Tools Used for Some Class Assignments and Demonstrations

- Wolfram CDF Player
  - Interactive documents
  - Installed on all EECS Windows computers
  - http://www.wolfram.com/products/player/

Course Outline

- Introduction, review and quiz
- Spectral Densities
- Double-sideband AM and Freq Div Muxing
- Suppressed sideband AM
- Angle modulation (FM/PM)

~ Test 1 →

- Noise models & Link Budgets
- Analog modulation noise analysis

~ Test 2 →

- Pulse mod (sampling, quantizing, coding)
- Pulse transmission and TDM
- Digital carrier modulation
- OFDM
- Optical communications links

Course Outcomes

- Calculate and use Fourier Series and Transforms, Energy Spectral Density and Power Spectral Density of signals.
- Explain mathematically the basics of analog modulation, DSB-SC, AM, SSB, PM and FM; comparing these in terms of bandwidth and power requirements; and using FDM to combine such signals.
- Explain mathematically the basics of PAM, PCM (including quantization noise), digital pulse transmission (including bandwidth requirements), and TDM.
- Explain mathematically the basics of digital modulation, ASK, FSK, PSK, and QPSK.
- Work with noise and signal-to-noise ratios, and comparing the noise performance of DSB-SC, AM, SSB, PM, and FM. Calculate bit error rate for digital modulation.
- Operating a spectrum analyzer and performing laboratory investigations of analog and digital communication systems.