ECE 220 – Signals and Systems I
Fall 2009
Lecture: Monday and Wednesday 4.30-5.45, Robinson B 208
Lab: Wednesday 10.30-12.20, ENG 5358; Thursday 10.30-12.20, ENG 1505
Recitation: Tuesday 1.30-2.20, ENG 3511; Friday 3.30-4.20, E 134

Course Instructor: Janos Gertler
ENG, Room 3211, jgertler@gmu.edu, 993-1604
Office hours: Monday and Wednesday, 3.00-4.00

Lab Instructor and Grader: Mohammad Ghorbanzadeh, mghorban@gmu.edu
Recitation Instructor: Khalid AlMuhanna, kalmuha1@gmu.edu

Prerequisite: C or better in ECE 201
Corequisites: MATH 203 and 214

Textbooks:
1. Signals and Systems (Second Edition), by Alan V. Oppenheim and Alan S. Willsky, Prentice-Hall, 1997. (This same book will be used in ECE 320.)

Goals: the course introduces the students to some of the basic concepts and mathematical techniques of signals and systems, that provide the foundations to further studies and practice in various areas of electrical engineering, including circuit analysis, signal processing, communications and control. Theoretical work is supplemented with hands-on laboratory exercises in MATLAB.

Subjects:

Part I. (book: Oppenheim and Willsky, chapters 1 and 2)
- Basic signal and system properties
- Linear time-invariant systems, convolution, impulse response and properties
- Differential equation description of time-invariant systems

Part II (book: Alexander and Sadiku, chapter 15)
- Laplace transformation, definition, properties
- Inverse Laplace transformation
- Convolution property
- Laplace transform solution of differential equations

Part III (book: Oppenheim and Willsky, chapters 3 and 4)
- Fourier series expansion of periodic signals
- Frequency response, Bode plot
- Basic filtering
- Fourier transform of continuous-time signals
Course work:

Lecture, two 75 minute sessions per week
Recitation, one 50 minute session per week
Laboratory, one 110 minute session per week

Homework, assigned every week, collected one week later
6 laboratory assignments
Two midterm exams, in-class, 75 minutes, covering Part I and Part II
Final exam, in-class, consisting of
   Third exam, covering Part III (75 minutes)
   Optional retake of Exam I or II (75 minutes)

Course grade:

Exams 3x20%  60%
Lab projects 6x5%  30% (individual work required!)
Homework 10% (individual work required!)

Lab projects:

1. Basic signals and signal manipulations
2. Convolution
3. Analysis of first-order system
4. Analysis of second-order system
5. Periodic signals, Fourier series
6. Frequency response, filtering

Week-by-week schedule (tentative):

Aug. 31 and Sep. 2  Basic signal properties
Sep. 7 and 9       Holiday (Sep. 7), Basic system properties
      14 and 16  System properties, impulse response
      21 and 23  Convolution
      28 and 30  Differential equation characterization and solution
Oct. 5 and 7       Laplace transform definitions, properties
Oct. 13 (Tuesday!) and 15 Midterm I (Oct. 13), Inverse Laplace transform
      19 and 21  Inverse transform, Convolution property
      26 and 28  Laplace transform solution of differential equations
Nov. 2 and 4       Periodic signals, Fourier series
      9 and 11  Frequency response
      16 and 18 Midterm II (Nov.16), Filtering
      23 and 25  Fourier transform basics. Holiday (Nov. 25)
      30 and Dec. 2  Fourier transform properties. Transform of periodic signals
Dec. 7 and 9       Parseval's relation, Convolution and multiplication properties
Dec. 16, 4.30-7.15 Final exam