ECE 220 – Signals and Systems I
Fall 2008

Lecture: Monday and Wednesday 1.30-2.45, King Hall 2053
Lab: Monday 10.30-12.20; Tuesday or 10.00-11.50, ST-I, Room 128
Recitation: Friday 1.30-2.20 (RA101) or Friday 2.30-3.20 (IN316)

Course Instructor: Janos Gertler
ST-II, Room 259, jgertler@gmu.edu, 993-1064
Office hours: Monday and Wednesday, 3.30-4.30

Lab Instructor: Nikita Charankar, ncharank@gmu.edu
Recitation Instructor/Grader: Mohammad Ghorbanzadeh, mghorban@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):

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topic</th>
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<tbody>
<tr>
<td>Aug.</td>
<td>25 and 30</td>
<td>Basic signal properties</td>
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<tr>
<td>Sep.</td>
<td>1 and 3</td>
<td>Holiday (Sep. 1), Basic system properties</td>
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<td></td>
<td>8 and 10</td>
<td>System properties, impulse response</td>
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<td></td>
<td>15 and 17</td>
<td>Convolution</td>
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<td></td>
<td>22 and 24</td>
<td>Differential equation characterization and solution</td>
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<tr>
<td>Sep.</td>
<td>29 and Oct. 1</td>
<td>Laplace transform definitions, properties</td>
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<td>Oct.</td>
<td>6 and 8</td>
<td>Midterm I (Oct. 6), Inverse Laplace transform</td>
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<td>14 (Tuesday!) and 15</td>
<td>Inverse transform, Convolution property</td>
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<td></td>
<td>20 and 22</td>
<td>Laplace transform solution of differential equations</td>
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<td>27 and 29</td>
<td>Periodic signals, Fourier series</td>
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<td>Nov.</td>
<td>3 and 5</td>
<td>Frequency response</td>
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<td>10 and 12</td>
<td>Midterm II (Nov.10), Filtering</td>
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<td></td>
<td>17 and 19</td>
<td>Fourier transform basics and properties</td>
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<td>24 and 26</td>
<td>Fourier transform of periodic signals, Holiday (Nov. 26)</td>
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<tr>
<td>Dec.</td>
<td>1 and 3</td>
<td>Parseval’s relation, Convolution and multiplication properties</td>
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<td><strong>Dec. 10, 1.30-4.15</strong></td>
<td>Final exam</td>
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