Massachusetts Institute of Technology
Dept. of Electrical Engineering and Computer Science
Fall Semester, 2007

6.02 Introduction to EECS 2

GENERAL INFORMATION

Staff:

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SECRETARY:  Rhonda Maynard  Rm. 39-527  x3-6857  rmaynard@mtl.mit.edu

Lectures:  Monday and Friday, 2 PM, Room 32-155

Labs:   Wednesday 2 PM – 5PM, Room 32-155 and 38 fifth floor labs.

Course Description:

EECS 2 gives a broad exposure to many EECS topics by investigating how information
(e.g., voice and data) is transmitted over a wireless network. The course is divided into
three major sections dealing with issues at three levels of abstraction: volt-by-volt
(analog), bit-by-bit (digital), and packet-by-packet (network architecture).

The course is organized as week-long modules, each consisting of

* a lecture that lays the foundation for the week's topic
* a pre-lab assignment preparing students for the week's lab
* a 3-hour lab involving both analysis and design
* a homework assignment involving problems and post-lab results
* a lecture that closes the loop on what happened in lab
* a short in-class concept "quiz"

Prerequisites:

8.02, 18.03 or 18.06, 6.01 or 6.001

Course Web Site: http://stellar.mit.edu/S/course/6/fa07/6.02/
GRADING

All of the items below will enter into the computation of the final grade.

**Quizzes:** There will be three quizzes at the end of each of the major sections of the course. The quizzes will be held during the regular class hour on:
- Part I - October 15
- Part II - November 14
- Part III - During final exam week

**Lab:** We expect that each student will learn most of the material during the lab session. All of the staff is committed to spend a considerable amount of time in the lab and is available to answer questions. Most of the labs will require some pre-lab work to prepare for the lab. This work allows us to make the most efficient use of the three-hour lab session. Labs will be evaluated based on completed pre-lab material and an exit interview after each lab conducted by a staff member. We expect that you will work in teams of two in the lab sessions. The pre-labs and post-labs can be turned in separately or as a team. If turned in separately we ask that you identify your lab partner. We will also encourage changing partners for each lab session.

**Mini Quizzes:** We will hold eight “mini-quizzes” that will take about 10-15 minutes to ensure that each student has a clear idea of the concepts in each module that were discussed in both lecture and lab. The dates are marked in the calendar on the next page.

**Homework:** There will also be post lab analysis involving the results from the lab session as well as substantive problems involving the concepts discussed in lecture and lab.

The course grade will tentatively use the following weighting factors:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weighting</th>
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<tbody>
<tr>
<td>Quizzes</td>
<td>45% (15% each)</td>
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<td>Lab (pre-lab and exit interview)</td>
<td>25%</td>
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<tr>
<td>Mini Quizzes</td>
<td>20% (~2.5% each)</td>
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<tr>
<td>Homework</td>
<td>10%</td>
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The final letter grade will also take into consideration non-numerical assessments of your command of the subject material as evaluated by the staff.
<table>
<thead>
<tr>
<th>Monday Lecture</th>
<th>Wednesday Lab</th>
<th>Friday Post-Lab</th>
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<tbody>
<tr>
<td>32-155</td>
<td>Lab: 38-5th Floor/ Lec: 32-155, 2:00pm – 5:00pm</td>
<td>32-155</td>
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<td>2:00pm – 3:00pm</td>
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- **Sept 5**: Course overview, lab environment
- **Sept 7**: Fourier Series introduction. Decomposition of periodic waveforms.
- **Sept 10**: Fourier Series with complex exponentials, Fourier Transform.
- **Sept 12**: Lab #1: Analyze and synthesize music in time & frequency domains.
- **Sept 14 [miniquiz]**: Modulation
- **Sept 17**: Filtering in continuous and discrete time; RC filter demo
- **Sept 19**: Lab #2: Modulation and filtering; receiving Frequency Division Multiplexed (FDM) signals.
- **Sept 21 [miniquiz]**: I-Q modulation
- **Sept 24**: Student Holiday, NO CLASS
- **Sept 26**: Introduce the digital abstraction, digital representation of waveforms.
- **Sept 28**: Digital Modulation I PAM, QAM Eye diagrams, Constellations
- **Oct 1**: Digital Modulation II: noise, inter-symbol interference, raised cosine filter.
- **Oct 5 [miniquiz]**: Energy and noise: Bit Error Rate (BER) vs. Signal-to-Noise Ratio (SNR).
- **Oct 8**: Columbus Day Holiday, NO CLASS
- **Oct 10**: Lab #4: Noise in digital receivers: SNR vs. BER.
- **Oct 12**: Fixed-length codes, hamming distance, detection and correction of single-bit and burst errors
- **Oct 15**: Quiz I
- **Oct 17**: Lab #5: Implement channel coding for digital receiver, decode corrupted bit stream
- **Oct 19 [miniquiz]**: Reed-Solomon codes (CD example)
- **Oct 22**: Combinational logic
- **Oct 24**: Lab #6: simple logic
- **Oct 26 [miniquiz]**: Arithmetic circuits
- **Oct 29**: Sequential logic, memories
- **Oct 31**: Lab #7: gate-level implementation of channel coding
- **Nov 2 [miniquiz]**: Digital signal processing implementation
<table>
<thead>
<tr>
<th>Nov 5</th>
<th>Nov 7</th>
<th>Nov 9</th>
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<tr>
<td>Source coding: variable-length codes, lossless compression</td>
<td>Lab #8: Implement &amp; evaluate Huffman codes for run-length encoded text images.</td>
<td>Perceptual Coding (JPEG example)</td>
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<tr>
<th>Nov 12</th>
<th>Nov 14</th>
<th>Nov 16</th>
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<tr>
<td>Veteran’s Day Holiday NO CLASS</td>
<td>Quiz II</td>
<td>Introduction to networking. Resource sharing and switching principles.</td>
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<th>Nov 19</th>
<th>Nov 21</th>
<th>Nov 23</th>
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<td>Best-effort networks. Coping with complexity with layering. What is a “protocol”?</td>
<td>NO CLASS/LAB</td>
<td>Thanksgiving Holiday NO CLASS</td>
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<th>Nov 26</th>
<th>Nov 28</th>
<th>Nov 30 [miniquiz]</th>
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<td>Channel access protocols (e.g., Aloha) and other link layer functions.</td>
<td>Lab #9: Implement and measure performance of Aloha protocol.</td>
<td>Network layer: addressing and forwarding</td>
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<th>Dec 3</th>
<th>Dec 5</th>
<th>Dec 7 [miniquiz]</th>
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<th>Dec 10</th>
<th>Dec 12</th>
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<td>Transport layer: reliable data delivery (loss recovery and windowing).</td>
<td>Lab #11: Implement a reliable transport protocol in the presence of lossy communication links.</td>
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Quiz III during finals week