IMPROVEMENT ACTIONS IN ELECTRICAL ENGINEERING 2008-2009

A. Change in methodology for measuring program outcomes

We have developed a more objective method for measuring the program outcomes in our courses. Previously, the outcomes were measured *indirectly* through a set of course objectives. In the new system, each course instructor identifies the main outcomes that are affected by that course. At least one instrument (HW, quiz, exam, lab) is chosen for each such outcome and student performance is measured. We have made sure that all outcomes are covered within the required course. This will provide a quantitative measure of how well a particular outcome is being covered in a course over time, as well as how each outcome is being covered over the entire curriculum. The method was piloted in a few courses this year and an easy implementation strategy has been worked out. It will be adopted in every course starting Fall 2009. This is a major change in measuring the effectiveness of the program outcomes quantitatively and brings EE in line with other departments in the College. The process was designed after extensive discussion in faculty meetings on 10/30/08. The importance of meeting all ABET requirements in each course was discussed by the Chair in the faculty meeting on 11/13/08.

B. New Courses

- A new technical elective EE162 (Introduction to Nanoelectronics) was approved. The course was proposed and approved so that students with a focus in the Nano Materials and Device area had the opportunity to learn the basic concepts required to understand nanoscaled electronic materials and devices. The syllabus is provided in Appendix C.

- A new required course on EE20 (Linear Methods for Engineering Analysis and Design Using MATLAB) has been designed and approved by the faculty. The faculty meeting was held on 04/01/09. The campus review of the EE program conducted by external reviewers organized by the Committee on Education Policy identified the need for an introductory course on MATLAB and on linear algebra. It is also part of the ABET requirements. This course addresses both needs. The plan is to start offering it from Spring 2010, in the Spring quarter of the freshmen year. This increases the EE faculty and students interaction in the freshmen year. This course will provide the students with the mathematical background in linear algebra and matrix analysis, along with applications in EE, and an introduction of using MATLAB programming as a tool in engineering design and analysis. The introduction to MATLAB prepares students for several courses that use MATLAB extensively. The syllabus is provided in Appendix C.

- CS 13 is offered for the first time this year and this second programming course better prepares students in programming and logic skills. The syllabus is provided in Appendix C.

- Catalog Changes: To better inform applicants to the EE program, we added the specialty areas of the EE department to the General Catalog.

C. Specific Course Improvements

- A list of specific course improvements that were made in the 2008-2009 academic year based on feedback from previous years, as well as the outcomes of these improvements, is attached as Appendix A.

- The department has started a process of revising all lab manuals starting in Spring 2008. A detailed list of changes made will be provided in next year's report.

- Changes made in lab equipment are listed in Appendix B.

D. Changes in Faculty

Anastasios Mourikis and Elaine Haberer joined the department in 2008-2009. They specialize in robotics and materials respectively.

APPENDIX A: COURSE SPECIFIC IMPROVEMENTS

EE 100A Electronic Circuits I

Improvement Actions Identified after Spring 2007 Course Offering

Based on the assessment of students performance in this class, which includes grades, evaluations, and other measurements (see EE assessment process), the following improvements are recommended for the next offering of this course.

1. Do more examples of diode operations and circuits in lecture, especially limiting circuits and rectifier circuits.

2. Do more amplifier design examples in lecture.

3. If class size is not too big, make the class more interactive, have the students participate in discussions in class.

Instructor Signature: ____

Instructor Name: ________Ping Liang__________________________

Comments on the Actions Taken During Fall 2008 Course Offering

1. Sufficient number of examples of diode operations and circuits were discussed in the class.

2. Sufficient number of amplifier design examples were discussed in the class.

3. Students participated in the discussions in class.

Instructor Signature: _____________Alexander Korotkov_____________

Instructor Name: ______________Alexander Korotkov__________________

EE 100A Electronic Circuits I

Improvement Actions Identified after Fall 2008 Course Offering

Based on the assessment of students performance in this class, which includes grades, evaluations, and other measurements (see EE assessment process), the following improvements are recommended for the next offering of this course.

1. Decrease coverage of Zener diodes to save time.

2. Increase coverage of BJT amplifiers.

Instructor Signature: _____________Alexander Korotkov_____________

Instructor Name: ______________Alexander Korotkov__________________

EE115 Introduction to Communication
Comments on the Actions Taken During Fall 2007 Course Offering

The following recommendations have been implemented during the Fall 2007 course offering.

1. Extra biweekly reviews were given for the homework problems. In lectures, more emphasis was given to to the power spectral density and wideband FM.

2. FDM and TDM designs were discussed in more detail in the end.

Instructor Name: ______ Ilya Dumer__________________

Instructor Signature: Ilya Dumer____________

Improvement Actions Identified after Fall 2007 Course Offering

Based on the assessment of student's performance in this class, which included grades, evaluations, and other measurements (see EE assessment process), the following improvements were recommended for the next offering of this course.

1. Include a detailed discussion and study of power spectral density.
2. Spend more time on discussion of Homeworks.

Instructor Name: ______ Ilya Dumer__________________

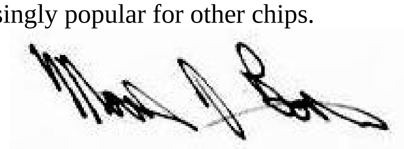
Instructor Signature: Ilya Dumer____________

EE - 128: Data Acquisition, Instrumentation, and Process Control

Comments on the Actions Taken During Fall 2007 Course Offering

The following recommendations have been implemented during the Fall 2007 course offering.

1. The lecture material is being revamped to put more emphasis on data acquisition tools such as the LabView tools widely used in industry.
2. Additional embedded systems (e.g., PIC microcontrollers) are being introduced as application solutions.
3. New laboratory material continues to be provided on the I2C bus since this type of synchronous serial bus is becoming increasingly popular for other chips.



Instructor Signature: ______________________________________

Instructor Name: _Matthew Barth__________

Comments on the Actions Taken During Fall 2008 Course Offering

The following activities have been implemented during the Fall 2008 course offering:

1. Switch to the GPL based HCS12 Assembly and C compilers (AsmIDE, EGNU GCC) to let students experiment with the HCS12 (Minidragon+) boards at home or during their Senior Design Projects;
2. Introduce the Assembly Language MCU programming since it is and will be used for time-critical application development for any microcontroller (1 Lecture and 1 Laboratory);
3. Provide detailed pre-lab guides on basic design skills expected to be acquired upon the completion of labs;
4. End of the course Mini-Projects are presented to all the students in class since this first of all motivates them to do a good job in front of their peers and secondly expands the scope of application ideas;
5. Final Mini-Projects are defended individually to identify details of implementation and ways to improve design choices.

Instructor Signature: __RC____

Instructor Name: _____Roman Chomko_____

Improvement Actions Identified after the Fall 2008 Course Offering

Based on the assessment of student performance in this class, which included grades, evaluations, and other measurements, the following improvements were recommended for the next offering of this course:

1. Keep the assembly language lecture but remove the assembly language based lab;

2. More detailed discussion of System Dynamics Control and examples of actual implementation using microcontrollers;
3. Develop a lab on MCU Control of Dynamic Systems (see recommendations 1, 2 above);
4. Improve the Lecture on industrial applications of microcontrollers including photo and video materials;

Instructor Signature: __RC____

Instructor Name: _____Roman Chomko_____

EE-133
Improvement actions identified after Fall 2008

Class attendance seemed to be particularly low. The class was at 9:40am TR. On average there seemed to be about 8 students present out of a class out of 21 enrolled. When I asked students if this was typical, they said that around 50% to 60% attendance was about normal. They said that this attendance did seem somewhat lower than average. There seemed to be a feeling that the 9:40am time of the class contributed to the low attendance. One student who grew up in So. Cal. mentioned that it was ‘cold’ in the morning. This course is not meant to be a correspondence course. I cannot teach the students if they are not there. The students need more than a book or online class notes to obtain an intuitive understanding of band diagrams and how to use them.

I found the textbook by Streetman and Bannerjee to be bloated, poorly organized, and verbose.

I assigned homework on ilearn once per week on Thursday due the following Thursday. I noticed that about 50% of the class was downloading the homework from ilearn on Wednesday before the discussion section, one day before it was due. Then, they were generally unable to complete it, since it was meant to be an entire week’s worth of homework.

Action Items for Next Year

1. Class Attendance

   I want to improve class attendance, but I am not sure of the best methods.

   a. I am considering assigning some course-grade weight to attendance – say 5%.
   b. Perhaps giving pop-quizzes in class
   c. Assigning homework every lecture due on the following lecture.
   d. Look into how to make the class more interactive.

2. Textbook

   I will switch textbooks to the one written by Pierret.

3. Homework

   I will assign homework assignments every lecture due the following lecture.

Roger Lake 12/10/2008

EE138: Electronic Properties of Materials

Comments on the Actions Taken During Fall 2008 Course Offering

The following activities have been implemented during the Fall 2008 course offering:

6. All theoretical material is to be supported by examples of implementation in real devices;
7. Use as many diagrams as possible to deliver information provided by formulas since they are easier to remember and facilitate the understanding of concepts;
8. Provide detailed examples on how to predict problem solutions without getting down to mathematics based on conceptual understanding;
9. Keep the class actively involved in the discussion of the material;

Instructor Signature: __RC____

Instructor Name: _____Roman Chomko_____

Improvement Actions Identified after the Fall 2008 Course Offering

Based on the assessment of student performance in this class, which included grades, evaluations, and other measurements, the following improvements were recommended for the next offering of this course:

5. Make a textbook by L. Solymar and D. Walsh, “Electrical Properties of Materials” **ISBN-13:** 978-0199267934 a requirement. It requires however additional theoretical treatment of some conceptual parts and more detailed description of electromagnetic/magnetic properties;
6. Increase the number of homework problems that require complete mathematical solutions. This however should be reasonably balanced since it is an introductory multi-disciplinary material science course that requires a lot of prior knowledge which is not quite expected.

Instructor Signature: __RC____

Instructor Name: _____Roman Chomko_____

Improvement Action of EE 141 Digital Signal Processing

From last offering in Fall 2007

In this quarter, I have revised the course content to focus on the very essentials of digital signal processing – Fourier transform and linear filter. I have also added a few topics that are more contemporary – random signals and subspace. The experience seems to suggest that the first part of this action is very effective which allows the students to grasp the fundamental more firmly. The second part of this action seems not very realistic. The added new topics were almost untouched due to students' progress.

Improvement action in Fall 2008

I focused the course on training the students in science and design that are the most required skills of an electrical engineers in digital signal processing by the current technology, namely, more advanced A/D conversion (oversampling, noise shaping, sigma-delta modulation), Fourier Transform (discrete time Fourier transform, discrete Fourier transform, FFT), IIR and FIR filters, filter design, methods for fast computing of convolutions. Students feedback suggests this was effective.

EE100B Electronic circuits II

Improvement Actions Identified after Spring 2008 Course Offering

Based on the assessment of student performance in this class, which included grades, evaluations, and other measurements (see EE assessment process), the following improvements were recommended for the next offering of this course.

1. Give more examples of the problems similar to problems in assignments and exams.

2. Start labs as late as possible to better synchronize labs and lectures.

Instructor Signature: ___________________ Alexander Korotkov ____________

Instructor Name: ___________________ Alexander Korotkov _____________

Comments on the Actions Taken During Winter 2009 Course Offering

1. More examples of the problems have been considered.

2. Labs started on the third week.

Instructor Signature: _____________Alexander Korotkov_____________

Instructor Name: ______________Alexander Korotkov__________________

EE100B Electronic circuits II

Improvement Actions Identified after Winter 2009 Course Offering

Based on the assessment of student performance in this class, which included grades, evaluations, and other measurements (see EE assessment process), the following improvements were recommended for the next offering of this course.

1. Keep the same coverage of the material.

2. Starting labs on the third week synchronizes labs and lectures.

Instructor Signature: ____________________ Alexander Korotkov ____________

Instructor Name: ____________________ Alexander Korotkov _____________

EE117 Instructor Sign-On and Improvement Actions

Win 2009

Previous assessment report from 2008 did not suggest any improvements.

Instructor Sign-On: Ilya Lyubomirsky

Suggested improvement actions for next offering:

1. **Need to provide more instruction on the design process for the term paper design project. Student term papers showed poor understanding of the design process.**

2. **Give a lecture on numerical techniques in electromagnetic device design to help the students with design project.**

Instructor Sign-Off: Ilya Lyubomirsky, March 23, 2009.

EE/CS120A Logic Design

Improvement Actions Identified after Spring 2008 Course Offering

Based on the assessment of student performance in this class, which included grades, evaluations, and other measurements (see EE assessment process), the following improvements were recommended for the next offering of this course.

1. Increase the examples of the behavioral-level designs using RTL design method and more tests on the RLC level designs.
2. Give more in lecture exercises during the lectures.
3. Add some hardware language coverages.

Instructor Signature: _____Signed__________________

Instructor Name: __Sheldon Tan_____________________

Comments on the actions taken for Winter 2008 course offering

The following recommendations have been implemented for the Spring 2005 course offering.

4. Increase the examples of the behavioral-level designs using RTL design method.
5. Give more in lecture exercises during the lectures.
6.

Instructor Signature: _____Signed__________________

Instructor Name: __________Sheldon Tan_____________

Comments on the Actions Taken During Winter 2009 Course Offering

The following activities have been implemented during the Winter 2009 course offering:

1. Increased material coverage of hardware testing (mixed-signal analysis using mixed signal DSO, JTAG, in-circuit emulation, design-for-testing concepts) and digital hardware component analysis;
2. Completely reworked laboratory assignments to get them in line with lecture objectives and timing of the material coverage;
3. Laboratory assignment included usage of standard electronic equipment such as oscilloscopes, signal generators, DMM and power supplies;
4. Introduced the end-of-course Mini-term project which students were free to choose on their own and/or take ideas from provided sample projects;
5. Increased the number of homeworks to 5 (five) and labs to 7 (seven) for more hands-on experience;
6. Cautiously integrated VHDL language into the course (mostly during labs and end-of-course lectures);
7. Increased the amount of time spent on RTL design methodology in lectures, labs and the mini-project discussions;
8. Midterm and Final examination were followed by the 2 (two) hour pre-test discussion sessions each, outside the regular lecture hours to review the lecture material and more importantly to improve problem solving skills.

Instructor Signature: _______________ rc __________________

Instructor Name: ___________ Roman Chomko __________

Improvement Actions Identified after Winter 2009 Course Offering

Based on the assessment of student performance in this class, which included grades, evaluations, and other measurements (see EE assessment process), the following improvements were recommended for the next offering of this course.

1. RTL design process still needs more time (examples) during lectures and in homework assignments;
2. The laboratories desperately need logic testing hardware: analog/digital mixed-signal multi-channel oscilloscopes (such as very affordable Bitscope 320 which was used for in-lecture demonstrations or at least basic logic probes);
3. VHDL concepts were grasped by students very well and ought to be integrated into the course on the permanent base (toward the end of the quarter);
4. More examples related to sub-components related to computer architecture should be added and how they are integrated;
5. End-of-course mini-term project was a success and should be kept as part of the course.

Instructor Signature: _______________ rc __________________

Instructor Name: ___________ Roman Chomko __________

EE114: Probability, Random Variables and Processes in Electrical Engineering

Improvement Actions Identified after Fall 2007 Course Offering

Based on the assessment of students performance in this class, which included grades, evaluations, and other measurements (see EE assessment process), the following improvements were recommended for the next offering of this course.

i) Too much time was spent on set theory and counting processes, which reduced the time for random processes later in the course. It may be better to reduce the initial part (it is not essential for the later parts of the course).

ii) The savings in time can be used to introduce some basic parameter estimation. I think, at the least, we can explain how the mean of a sequence is actually a parameter estimate using a simple signal + noise model. It will also provide an application flavor.

iii) Students need to be told explicitly the difficulty level of the course, how important it is to do the HWs, just listening to the lectures is not enough in a math-heavy course and that the course ramps up very quickly and it is difficult to catch up later. Regular 5 min. quizzes may be a possible solution.

Instructor Name: Amit K. Roy-Chowdhury

Comments on the Actions Taken During Spring 2008 Course Offering

The following recommendations have been implemented during Spring 2008 course offering.

i) The time spent on set theory and counting processes was reduced to one week. The savings in time was used for more examples on multiple random variables and random processes.

ii) Students were explicitly warned about how quickly the course ramps up. Quizzes were held every week regularly, with the understanding that the quiz problem would always be similar to one of the homework problems that were due the same day.

Instructor Name: Ertem Tuncel

Improvement Actions Identified after Spring 2008 Course Offering

Based on the assessment of students performance in this class, which included grades, evaluations, and other measurements (see EE assessment process), the following improvements were recommended for the next offering of this course.

i) More connections to "real life" (not necessarily engineering problems) could motivate students more. A possible example is as follows.

- Students can gather their cell phone bills for the last 12 months or so, and using some statistics (e.g., total minutes, nights and weekends, text messages, etc.) as random variables, they can try to minimize their bills by choosing the most appropriate plan.

Instructor Name: Ertem Tuncel

Comments on the Actions Taken During Spring 2009 Course Offering

i) Regular quizzes every week were instituted.
ii) Real-life examples were given in class and covered in more details in the discussion sessions. Two examples were: height of students, driving time from UCR to LA downtown.

EE 144: Introduction to Robotics

Instructor name: Anastasios Mourikis

Improvement actions implemented in Spring 2009

During the Spring 2009 offering of the course, the two following changes were made:

i) the labs were completely re-designed, and now involve programming mobile robots using a high-level API and using visual sensing
ii) material on current sensing techniques used in mobile robotics was presented

These changes were implemented in response to recent developments in the area of robotics, which show a proliferation of mobile robots (e.g, domestic and service robots). In academia, as well as in industry, the focus shifts from robot manipulators to autonomous mobile robots, and the changes made in the course reflect this shifting focus. The primary goal was to introduce students to the key concepts and skills that are necessary when dealing with both of these domains: in the lectures, the main focus was on the mathematical description and analysis of robot manipulators, while in the labs, the students became familiar with programming mobile robots for accomplishing simple tasks in real-world environments.

Improvement actions proposed for next course offering

Based on the students performance in homeworks, quizzes, labs, and exams, the student evaluations, as well as the interest exhibited by the students on different parts of the course material, the following improvements are suggested:

i) Try to align the material covered in the lectures with the labs. While the goal of the current course design was to give the students an idea of "both worlds" (robot manipulators in the lectures, and mobile robots in the labs), an effort should be made to point out the common elements of the two areas.
ii) Try to shift the focus of the course even more towards mobile robotics. Students exhibited great interest and enthusiasm for mobile robot programming and sensing, and much less interest in the material on robot manipulators. This change may require a fundamental re-design of the course syllabus, and a change of textbook. This issue should be discussed with the instructors of other courses in the Control and Robotics and Intelligent Systems areas, to align any potential changes with the wider needs of the curriculum.
iii) The students had difficulties with mathematical tools such as Jacobians and the chain rule of differentiation, and with linear systems of equations. It would be helpful to have a review of such concepts in class

Appendix B: 2008-2009 Summary of Teaching Lab Changes

ENGRII 121 - Computers were upgraded in September 2008. The computers were upgraded from 16 of Pentium 4 3.0GHz CPU, 512MB RAM, 40GB Hard drive to what is shown in the current equipment list below. Software installed on the machines is Matlab, Cadence Capture CIS and Layout Plus, Xilinx Webpack ISE, Freescale CodeWarrior, and Microsoft Office. The older computers used with the ECP Model 205 Torsional Plants were too slow to run Matlab and other applications adequately (the computers would lock up or take minutes in some cases to compile or simulate.) Since the torsional plants require the use of ISA slot cards on the host computers, the new machines could not be used with the torsional plants and the old computers had to be kept in order to use the torsional plants, which were moved into room 126.

Current equipment:

16 of 19inch LCD monitors, Core 2 Dou 2.53GHz CPU, 3.24GB RAM, 80GB Hard drive

16 of HP 54600B Oscilloscope

16 of HP 33120A Waveform Generator

16 of HP E3630A Power Supply

16 of HP 34401A Meter

ENGRII 125 - Doubled amount of Digilent Basys FPGA evaluation board, from 20 to 40, to meet the needs of a nearly doubled enrollment size in EE/CS 120A for Fall 2008. Software installed on the machines is Matlab, Cadence Capture CIS and Layout Plus, Xilinx Webpack ISE, Freescale CodeWarrior, and Microsoft Office.

Current equipment:

16 of 17inch LCD monitors, Pentium 4 3.0GHz, 1GB RAM, 80GB Hard drive.

14 of 19inch LCD monitors, Core Dou 2.66GHz, 2GB RAM, 80GB Hard drive.

ENGRII 126 - Lab was set up for regular use. Computers were moved in from room 121 along with the ECP Model 205 Torsional Plants. Outdated equipment was temporarily used. 16 of Tektronix 2232 Analog Oscilloscope and 16 of Wavetek Model 22 Waveform Generator were replaced with the oscilloscopes and waveform generators from room 128, which is listed in the current equipment list. 20 new lab stools were purchased to be used in room 126 and to replace a few broken stools from the other labs, 121 and 128. Software installed on the machines is Matlab, Cadence Capture CIS and Layout Plus, Microsoft Office, and ECP Torsional Plant software.

Current equipment:

16 of 17inch CRT monitors, Pentium 4 3.0GHz CPU, 512MB RAM, 40GB Hard drive

16 of Tektronix TDS420A Oscilloscope

16 of HP 33120A Waveform Generator

16 of Power Supply

16 of Fluke 45 Meter

12x ECP Model 205 Torsional Plants

9x ECP Model 205 ISA computer control cards

1x ECP Model 205 PCI computer control card

ENGRII 128 - Oscilloscopes and waveform generators were upgraded in April 2009 and June 2009 respectively. 16 of Tektronix TDS420A Oscilloscope and 16 of HP 33120A Waveform Generator were moved into room 126. The replacements are 16 of Agilent DSO3102A Oscilloscope and 16 of Agilent 33210A Waveform Generator. Software installed on the machines is Matlab, Cadence Capture CIS and Layout Plus, Xilinx Webpack ISE, Freescale CodeWarrior, and Microsoft Office.

Current equipment:

16 of 17inch LCD monitors, Pentium D 2.80GHz CPU, 1GB RAM, 80GB Hard drive

16 of Agilent DSO3102A Oscilloscope

16 of Agilent 33210A Waveform Generator

16 of HP E3630A Power Supply

16 of HP 34401A Meter

Appendix C: New Course Syllabuses

EE 162: Introduction to Nanoelectronics

Course Description

Presents the basic concepts of nanoelectronics with a focus on current flow through nanostructured devices. Topics include new paradigms of nanoelectronics, an atomistic view of electrical resistance, Schrodinger's equation, the self-consistent field procedure, basis functions, bandstructure, subbands, capacitance (classical and quantum), level broadening, and coherent transport.

Students will independently conduct a review of one area of nanoelectronics, write up their review in a term paper, and present a 10 minute summary presentation in class.

Course Type (Required or Elective)

Electrical Engineering, Elective;

Prerequisite(s)

EE 133 or Phys. 150A or consent of instructor; familiarity with MATLAB or equivalent and with basic matrix algebra is recommended.

Textbooks and Related Materials

Supriyo Datta, "Quantum Transport: Atom to Transistor," .Cambridge University Press, 2005. ISBN: 0-521-63145-9.

Course Objectives

1. Understand energy level diagrams.
2. Understand charging effects and Coulomb blockade.
3. Understand the quantum capacitance.
4. Calculate current from a rate equation approach.
5. Calculate bandstructure for simple models.
6. Calculate the density of states.
7. Understand broadening and transmission.
8. Understand coherent transport.
9. Obtain a general overview of the field of nanoelectronics.

Topics

Week 1: Secs. 1.1 – 1.3. Energy level diagram, electron flow, quantum conductance
Week 2: Secs. 1.4 – 1.6. Charging effects, Coulomb blockade, Ohm's law
Week 3. Secs. 2.1 Schrodinger equation, Hydrogen atom
Week 4. Secs. 2.2 – 2.3 Finite Difference solution, atomic energy levels
Week 5. Secs. 2.2 - 2.3, 3.3 Covalent bonds, basis functions
Week 6. Sec. 5.1 – 5.2 Bandstructure, Reciprocal Lattice
Week 7. Secs. 6.1 – 6.2 Graphene, Carbon nanotubes, Density of states
Week 8. Secs. 6.3, 7.3 Minimum resistance, quantum capacitance
Week 9. Secs. 8.1, 9.1 Broadening, Transmission, Coherent transport
Week 10. Secs. 9.1 Current-voltage response

Grading Policy

Homework 25%
Midterm 25%
Final 30%
Term Paper 20%

CS 013 - Introductory Computer Science for Engineering Majors

Syllabus

Week 0
C++ Review

Week 1
C++ Classes
Programming assn 1, Lab 1
Linux Review
make
Big C++ Graphics

Week 2
C++ Classes (cont.)
C++ Pointers
Programming assn 2, Lab 2
Multiple File Compilation, makefile/multi-file compilation tutorial

Week 3
C++ Pointers (cont.) & Arrays
Programming assn 3, Lab 3
Large Projects, Debugging

Week 4
C++ Inheritance
Programming assn 4, Lab 4
Dynamic Memory & Classes

Week 5
C++ Inheritance (cont.)
Midterm, Lab 5

Week 6
Testing & Debugging
C++ Streams
Programming assn 5, Lab 6 (teamwork)

Week 7
Recursion
Programming assn 6, Lab 7

Week 8
Recursion (cont.)
Linked lists
Lab 8, Programming assn 7

Week 9
Linked Lists (cont.)
Sorting & Searching
Lab 9

EE 020 - Linear Methods for Engineering Analysis and Design Using MATLAB

Syllabus

Week 1: Introduction to MATLAB programming: Vectors and arrays, matrices, functions, execution control, recursion, input and output, plotting and graphics.

- Chapters: Appendix of the textbook, online MATLAB manuals
- Programming/HW: Programming assignments to familiarize students with MATLAB

Week 2: Brief introduction of circuits, and formulation of circuit problems to linear equations using Kirchoff's laws.

- Chapters: Selected material from Chapters 1-4 from the reference book
- Programming/HW: Writing circuit equations for simple circuits, more programming assignments to familiarize students with MATLAB

Week 3: Methods for solving a linear system of equations.

- Chapters: 1 from the textbook
- Programming/HW: A program for solving a given system using Gaussian elimination.

Week 4: Determinants, rank, inverses, and LU-factorization.

- Chapters: 2 and 5 from the textbook
- Programming/HW: A program for solving a given system using matrix inversion.

Week 5: Steady-state AC circuit analysis using vectors and complex numbers.

- Chapters: Selected material from Chapters 6 and 9 from the reference book, Chapter 8 from the textbook.
- Programming/HW: Writing circuit equations for simple AC circuits, write a program to solve circuit equations using phasors

Week 6: Vectors spaces, subspaces, linear independence, bases, dimension, and linear transformations.

- Chapters: 3 and 7 from the textbook
- Programming/HW: Signal and system application examples, write a program to simulate system response using state transition matrices

Week 7: Orthogonality, dot product, norm, projections, and orthogonal subspaces.

- Chapters: 4 from the textbook
- Programming/HW: Signal and system application examples, write a program to compute a least square estimation and the estimation error

Week 8: Eigenvalues and eigenvectors, the concept of state space in linear systems, and diagonalization.

- Chapters: 6 from the textbook
- Programming/HW: Control system application examples, write a program to implement a simple state-space control system

Week 9: Applied eigenvalue problems, systems of linear differential equations.

- Chapters: 6 from the textbook
- Programming HW: Control system application examples, write a program to find eigenvalues and eigenvectors of a state-transition matrix

Week 10: Engineering design using linear programming: Standard forms, geometrical methods, duality, mixed constraints, and the simplex algorithm.

- Chapters: 9 from the textbook
- Programming/HW: Formulate a filter design problem as an optimization problem, write a program to find the solution.

EXAMS: One midterm and one final.

HOMEWORK: There will be weekly homework assignments and programming assignments

GRADING: HW and Programming: 25%, Midterm: 35%, Final: 40%

TEXTBOOK: Linear Algebra for Engineers and Scientists Using Matlab, Kenneth Hardy, 2005, Prentice Hall

REFERENCE BOOK: Electric Circuits, J. Nilsson & S. Riedel, 7th ed., 2004, Prentice-Hall