HANDS-ON COMPUTER ENGINEERING

Professor: Cyrus Bazeghi

Tutor: Stephanie Schnack
What is Engineering

- Engineering is Design
  - Always with constraints
- What is the process of design?
What is engineering?

- What is a problem that needs solving?
- How might you start solving it?
What is Computer Engineering?

- Computer Engineering includes
  - Designing computers
  - Designing computer-based systems
    - Embedded systems
    - Autonomous systems
    - Multimedia systems
  - Creating design tools for computer engineering
What is Computer Engineering

- Computer engineering is a mix of hardware and software
  - Some problems are best solved with software
  - Other problems are best solved with hardware
  - The most fun problems require hardware and software.
What is Electrical Engineering?

• Design and analysis of ….  
  • Electronic/electrical/optical components and associated signals.
• Creation of systems using these components  
  • Usually including computers
• Electrical engineering integrates disciplines  
  • physics, chemistry, mathematics, computers, biology, electronics, optics, electromagnetics, communications, video, remote sensing…….
• Devices to Systems and Applications to the real world
What is Computer Science?

- Computer science is the study of the theoretical and practical aspects of computer technology and computer usage.
- Computer science generally concerns software and theoretical computing.
- As with other engineering fields, many computer scientists focus on solving problems in other disciplines.
What is Bioinformatics?

- The design and use of computational and statistical tools to understand biological data, especially as the result of high-throughput experimentation.
- The UCSC program has a strong tool design focus.
- Quiz: What is Biomolecular Engineering?
What is Bioengineering

- The UC Santa Cruz B.S. in Bioengineering program prepares graduates for a rewarding career at the interfaces between engineering, medicine, and biology. UCSC Bioengineering graduates will have a thorough grounding in the principles and practices of bioengineering and the scientific and mathematical principles upon which they are built; they will be prepared for further education (both formal and informal) and for productive employment in industry.
Computer Technology Minor

- As much computer engineering as you can do without calculus
  - CE1, CE12/L, CE100/L, CE80N
  - 2 courses programming
  - CE80E, EE80T, ISM101 (1 credit)
  - 2 upper-division electives
  - 194F (2 credit) and essay.
How do you choose?

- Pick Computer Engineering since you get to do everything.
- Or
  - Take CE1, CE12, CE100 (and possibly 8, 80N, 80U, 80A)
  - Take CS10, CS12A, CS12B
  - Take EE80T, EE70
- Or
  - Focus on the most requirement-intensive major you may be interested in
- Or
  - Talk to faculty and students
What else should you do?

- The SOE majors are all hard, so
  - Join a student organization (or several!!)
    - **SWE**  [http://sweslugs.soe.ucsc.edu/](http://sweslugs.soe.ucsc.edu/)  
      - Society of Women Engineers
    - **ISMA**  [http://isma.soe.ucsc.edu/](http://isma.soe.ucsc.edu/)  
      - Information Systems Management Association
    - **IEEE**  [http://ieee.cse.ucsc.edu/](http://ieee.cse.ucsc.edu/)  
      - Institute of Electrical and Electronics Engineers
  - Visit the advising WWW site often
  - Read the undergraduate newsletter
  - Drop in for advising too
  - Sign up for a peer mentor
  - Get free lunch at CEFULs
Computer Engineering Research

- Computer Aided Design
  - VLSI, FPGA, MCM
- Computer Systems
  - Computer architecture, parallel processing
- Sensing and Interaction
  - 3D modeling, sensor nets, assistive technology
- Embedded and Autonomous Systems
  - Embedded software, robotics and mechatronics
  - Biomedical robotics
- Networks
  - wired and wireless, ad hoc and mobile
What does Cyrus do?

- Logic design and Architecture
  - 3D graphics (3dfx, Believe)
  - Media processors (think a Tivo on a chip)
  - Memory controllers
- Embedded Systems
  - Dolphin tread mill
  - Elephant seal tracker
  - Autonomous sensor buoy
  - Coyote tracker
What is Cyrus’ Background?

- BS in Computer Engineering
  - Hardware design track
- MS in Computer Engineering
  - Embedded systems and VLSI
  - Built a tracking device for elephant seal research
- PhD in Computer Engineering
  - Architecture based complexity analysis
- 15 years of industry experience in logic design and architecture
- Teaching at SOE since 1998 off and on fulltime and part time
CE 1 Organization

- Weekly labs with short (?) talks beforehand
  - LEDs
  - Digital logic and computer hardware
  - Scribbler Robots
  - Unix & Programming

- Weekly graded research problems

- Guest lectures on computer engineering, e.g.
  - Robotics
  - Networks
  - CE/EE 123B Project Presentations
Using the Lab

- CE 100 uses this lab
  - But not during our class
- No food or drink in the lab
- No backpacks on the lab tables
- Be careful of the equipment
CE1 Requirements

- Have Fun!
- Do the homework – it’s on the web page
- Come to class and do the labs (and check our website for notes and updates).
- Maintain a lab notebook
  - Bring a bound notebook (preferably graph paper) to the next class (see class website for background and details)
- Take the final!
  - Attend and (briefly) report on the senior design projects or the Mechatronic’s class demo