Lecture 1: Course Overview & Brainstorming

Professor Carr Everbach

Course web page: http://www.swarthmore.edu/NatSci/ceverba1/Class/e5/
Administrivia

- Names...
- Lab Sections (not everybody can be in section B).
- Keys (Hicks 213, outside door). See secretary in Hicks 203.
- E5 web page: [http://www.swarthmore.edu/NatSci/ceverba1/Class/e5/](http://www.swarthmore.edu/NatSci/ceverba1/Class/e5/)
- Lab reports online via website you create using WordPress.
- Approximately weekly, relatively short, assignments mostly completed in lab.
- Fun robot tag project.
- No exams.

- Department picnic September 9th late afternoon!
Academic Resources

- Ann Ruether coordinates Academic Resources for the Engineering Department
  - Hicks 307
  - arueth1@swarthmore.edu
  - x8081
- Problem Sessions for Engineering (Tues & Wed nights H213), Physics (Sunday, Tues in SC128 and Monday in Hicks) and Math
- eSams
- Tutoring
- Wizards website
  - http://www.swarthmore.edu/wizards.xml
Other resources...

In no particular order:
- Your course professor
- Wizards
- Me
- Professor Molter (chair)
- Your advisor

- Academic Resources Coordinator:
  - Ann Ruether
    Hicks 307, aruethe1@swarthmore.edu, x8081
Contacting me (Carr Everbach)

- X8079
- ceverba1@swarthmore.edu
- Hicks 217
Course Goals

• Learn about engineering – discover which areas interest you.
• Learn to work effectively on teams.
• Create/use a website to collaborate.
• Learn some matrix math and Matlab (“the language of technical computing”).
• Learn some mechanical/electrical/computer skills in the robot tag project.
Resumés

- Email or hand me a brief description of your strengths and weaknesses as regards the Galumphing Robot Tag project

- I will assemble teams within each lab group, attempting to ensure that teams have approximately equal expertise
Things to keep in mind...

- Lab starts this Thursday in Trotter 201. Make sure your name and lab section are correct on the signup sheet.
- Resume to me by end of lab this Thursday.
- Personal web page due 9/8.
- Ball Drop – 9/9 – late afternoon, followed by department picnic
- Shop class (not required – only if you are interested). Starts 9/16 (Fridays 1-4 pm). Sign up in Engineering Department Office.
engin@swat

What is available from the Engineering Department at Swarthmore?

• Nominally you can concentrate in one of four areas
  1. Civil/Environmental
  2. Computer
  3. Electrical
  4. Mechanical
  5. Others... (bio, aero, chemical...)


Civil/Environmental Engineering

- Civil – roads, buildings, bridges...
- Environmental – remediation, landfills...
- Courses
  - E6 – Mechanics (core)
  - E59 – Mechanics of Solids
  - E60/E62 – Structures 1 and 2.
  - E61 – Soil Mechanics
  - E35 – Solar Energy Systems
  - E57 – Operations Research
  - E63 – Water Quality and Pollution Control
  - E66 – Environmental Systems
  - E86 – Dynamics
- Faculty – Siddiqui, McGarity, Everbach
Computer Engineering

- Hardware – how do computers work?
- Software – how to tell a computer to do something.

Courses
- E15 – Digital Systems (core)
- E24 – VLSI Design
- E25 – Computer Architecture
- E26 – Computer Graphics
- E27 – Computer Vision
- E28 – Robotics

Faculty – Moreshet and Zucker
Electrical Engineering

- Design of electronic devices, systems
- Courses
  - E11 – Electric Circuits (core)
  - E15 – Digital Systems (core)
  - E24 – VLSI
  - E71 – Digital Signal Processing
  - E72 – Electronics
  - E73 – Physical Electronics
  - E75 – Electricity and Magnetism
  - E78 – Communications
- Faculty – Molter and Cheever
Mechanical Engineering

- Engines, energy, mechanisms, materials
- Courses
  - E6 – Mechanics (core)
  - E41 – Thermofluid Mechanics (core)
  - E59 – Mechanics of Solids
  - E81 – Thermal Energy Conversion
  - E82 – Materials
  - E83 – Fluid Mechanics
  - E84 – Heat Transfer
  - E86 – Dynamics
- Faculty – Everbach and Macken
Other courses

- E12 – Linear Systems (core)
- E14 – Experimentation for Engineering Design (core)
- E58 – Control Theory
- E90 – Senior Design (core)
- E91 – Directed Reading / Special Topics / Project
Get involved

- ASCE – American Society of Civil Engineers
- ASME – American Society of Mechanical Engineers
- IEEE – Institute of Electrical and Electronics Engineers
- NSBE – National Society of Black Engineers
- SWE – Society of Women Engineers
- SSE – Swarthmore Society of Engineers
Artifacts

- For one week from Thursday, read both the “Fork” and “Mirrored” articles from E5 website.
- Post a short (~ half-page) summary and critique of each article on the website that you will create this Thursday.
- In the critique, focus on the design process and the factors that force human-made artifacts to evolve.
Design Process

Define Need
Smaller Cell Phone

Define Problems to be solved
Dimensions
Battery life
Antenna
User interface

Research and Design
Battery types
NiMH
LiIon
LiPolymer

Synthesis
Build Prototype

Evaluation
Test Battery Life.
Does battery catch fire?

Optimization
What didn't work well?
Different Technology?
Other design considerations

- Economic
- Environmental
- Sustainability
- Manufacturability
- Ethical
- Safety/Health
- Social/Political
- Aesthetic
Design in E5

We’ll do all levels of design. This first project will only do the R&D and Synthesis phases (no iterations).

For the first project we’ll use an R&D technique called brainstorming.
Brainstorming

- Quickly select one recorder, and one moderator.
- Recorder keeps track of all of the ideas suggested.
- Moderator keeps things moving and according to rules.

- Start by having the recorder get everybody’s name and contact information.
Brainstorming

• Try not to pass judgment on ideas; all ideas are potentially good so do not judge them until after the session.
• Write down all of the ideas. At this point there are no bad ideas. More is better.
• Build and expand on ideas of others.
• Encourage everybody to participate; each person has a valid viewpoint and unique perspective on situation and solution.
• Each idea presented belongs to the group, not to the person stating it. You are not in competition with each other.
• More at: http://www.swarthmore.edu/NatSci/echeeve1/Class/e5/E5Lecture1/E5BrainStorm.pdf
**E5 Ball Drop (1st design project)**

- Goal is to get a tennis ball to stay in the air as long as possible when dropped from Hicks roof.
- One member of the team, and only one, will release the device (it may not be thrown upwards).
- Design must contain only what is supplied to you: bubble wrap, duct tape, sticks, string, rubber bands. You may use other tools in the construction.
- Today: brainstorm ideas
- Weekend: Meet to choose final idea from brainstorming session and do construction (2-4 hours).
- Creativity counts (take risks).
- Test of devices on September 9th (before picnic).
Ball Drop Teams

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<tr>
<th>Dana-Hallowell Hicks 303</th>
<th>Parrish and off-campus folks Hicks 310</th>
<th>Wharton Hicks 312</th>
<th>Willets Hicks 314</th>
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