Introduction to engineering

• What’s an engineer? Definition, characteristics, job description, etc.

• How does an engineer differ from a tradesperson? Electrical engineer vs. electrician? Mechanical engineer vs. car mechanic?

• How does an engineer differ from a scientist?
One definition

• Scientific and mathematical principles

• Applies...to practical ends

• Design, manufacture (i.e. build/implement), test, operate
  – Different phases in the lifetime of a system

• Efficient, economical
  – Engineers tend to value function over form

• Structures, machines, processes, systems
  – Engineers design/build/test/operate stuff
  – Different types of engineers work on different types of systems

Aerospace Engineering  Engineering Physics
Biomedical Engineering  Environmental Engineering
Chemical Engineering  Industrial and Operations Engineering
Civil Engineering  Materials Science Engineering
Climate and Meteorology  Mechanical Engineering
Computer Engineering  Naval Architecture Engineering
Computer Science  Nuclear Engineering and Radiological Sciences
Data Science  Space Sciences and Engineering
Electrical Engineering
• Characteristics of engineers
  – Good at math and science
  – Likes to understand how things work
  – Likes to solve problems
  – Likes to improve existing systems
  – Likes to invent new solutions (or even new problems)

• What are engineers good for?
  – Good at theory and practice
  – Good at solving real problems effectively and efficiently

• Etymology
  – ingeniosus (skilled)

Introduction to computer engineering

• Computer engineers design/build/test/operate systems that involve computers.
• What are some devices you own that have a computer processor?
Overview of course

• Goal: experience the life cycle of a substantial computer engineering project

• Microprocessor-based educational toy
  – Microprocessor: general-purpose, programmable computer
  – Device drivers for I/O devices
  – Educational toy (runs as application on your microprocessor). User interacts with toy via input/output devices. Toy responds according to custom algorithm, computed on your microprocessor.
  – Examples: music synthesizers, interactive stuffed animals, video communicators, rhythm/music games, remote-controlled nerf guns, talking globes, interactive audio books, ...

Project done on Altera DE2-115 development board

• FPGA (field-programmable gate array)
• SRAM, SDRAM
• LEDs
• Switches and buttons
• PS/2 keyboard
• USB mouse
• Audio interface (speaker, microphone)
• VGA interface
• LCD display
• Secure digital card
• Serial port
• Video camera
• Also infrared, Ethernet, Flash RAM
Course will introduce many aspects of computer engineering

- Digital logic
- Implementing algorithms in hardware
- Implementing a computer in hardware
- Programming a computer in assembly language
- Interfacing to I/O devices
- Digital audio
- Operating systems

Workload

- 4 credits ➔ 12 hours/week
  - Lecture (3 hours)
  - Lab (2 hours)
  - Discussion (1 hour)
  - Group meeting (1 hour)
  - CSE work outside lab (2-3 hours)
  - TC work (2-3 hours)