Announcements

• No office hours today.
• Assignment 7 due ahead of recitation next week.
• Journal check next week.
• Exam graded (hopefully) by next week.
Assignment 8: Design Fair

- May 1, 12:00 – 6:00 p.m., SUB Ballrooms
- Let me know if you need power, other.
- Poster and Model will be evaluated
- Team & individual presentations expected
- Some at table all the time
- Everyone there for one hour minimum
Assignment 9: Final Package

- Team binders
  - updated assignments under each tab
- Design Journals
  - final check
- Due 5:00 p.m., Monday, May 5
- Grading Sheet
Lifecycle Engineering

Design

Fabrication or Construction

Distribution

Use + Service

Disposal

Design with the entire lifecycle in mind.

Montana State University
College of Engineering
Mountains & Minds
Early decisions have biggest effect on lifecycle costs.

90% $
Early decisions have biggest effect on lifecycle costs.

$90\%$

$\$\$

Concept | System | Detail | Proto/Test/Analysis | Fabrication

actual cost incurred
Early decisions have biggest effect on lifecycle costs.

- Concept System Detail Proto/Test/Analysis Fabrication
- 90% actual cost incurred
- $ cost committed
- $
Modern engineering design practice

- Takes the full lifecycle into account.
- Current trends:
  - manufacturability / constructability
  - reliability / robustness
  - disposal / recyclability
Concurrent Engineering

Design Engineering

Time
Concurrent Engineering

Design Engineering

Manufacturing Engineering

Time
Concurrent Engineering

Design Engineering

Fabrication Design

Time

informs product design
Fabrication Design

- In Manufacturing
  - equipment specifications, layout, assembly sequence, material flow, etc.

- In Construction
  - construction methods, sequence, timing
Some Design Principles

- Use standard parts and sizes.
- Modularize the design.
- Minimize the number of parts.
- Minimize part variation.
- Maximize tolerances.
- Allow access
Robust Design

• Design so that the system is NOT sensitive to variations in:
  – manufacture
  – environment
  – use
  – etc.

• Taguchi methods
Design for Recyclability, Disassembly, Reuse

- Materials selection
- Fabrication techniques: allow disassembly?
- Packaging
  - marketing and aesthetics
  - product protection
  - storage
  - waste