ME – 2110
Creative Decisions and Design

Thomas R. Kurfess, Ph.D., P.E.
HUSCO/Ramirez Distinguished Chair in Fluid Power and Motion Control
Woodruff School of Mechanical Engineering
Georgia Institute of Technology
Atlanta, Georgia USA

ME 2110 - Creative Decisions & Design

- Studio Instructors:
  - Dr. M. Dinar
  - Dr. J. Donnell
  - Ms. K. Mehaffey
  - Dr. R. Moore
  - Dr. H. Rashidi
  - Dr. C. Saldana
  - Dr. R. Simmons
  - Dr. J. Streator
  - Dr. C. Telenko
  - Dr. C. Ume

- Lecture
  - M, W, 3:00 – 3:50 PM, Clough 152
- Studio
  - MRDC 2101 (Studio Classroom)
  - MRDC 2102 (Design Studio Shop)
  - Various Times
- Web site
  - http://2110.me.gatech.edu/

Course Objectives

- To learn
  - fundamental procedures for solving engineering design problems
  - the essential details of
    - analyzing, synthesizing, and implementing design solutions
  - with
    - flexibility, adaptability, and creativity
  - the techniques which allow an engineer to tackle new, unsolved, open-ended problems
  - by doing through team and individual projects and assignments.

Reality Check (1)

- This course is about
  - understanding alternatives
  - problem solving
  - organization
  - writing
  - presenting
  - getting a taste of the real world
- Professionalism
  - projects
  - reports
  - attendance.

Reality Check (2)

- Do's
  - follow instructions
  - be in class on time
  - be in studio on time
  - pay attention
  - use the tools that are presented
  - read the book
  - give professional presentations
  - act professionally
  - follow procedures (safety)
  - clean-up in studio
  - report damaged equipment

- Don't's
  - miss class
  - turn in hand written reports
  - give hand written presentations
  - close your minds to the alternatives
  - sleep in class
  - bring food into studio
  - leave a mess in studio.

Your Grade

Studio Preparedness	10%		
Homework	15%		
Class Participation	5%		
Structure Lab	5%		
Introductory Project	10%		
Major Project	55%		
	Planning Report and Presentation	(5%)	
	Evaluation Report and Presentation	(5%)	
	Machine Performance	(15%)	
	Presentation to Judges	(5%)	
	Final Oral Presentation	(10%)	
	Final Report	(15%)	
Give at least one oral presentation			P/F
Electronics, machining, and pneumatics training			P/F

Attendance

- You must attend all studios
  - attendance will be taken
  - missing a studio results in a 0 for that studio grade
  - missing a studio assignment results in a letter grade reduction
- You must attend all lectures
  - attendance will be taken at 3:00 PM
  - being late (arriving between 3:00 and 3:10) is 0.5 of a missing lectures
  - we will be using a seating chart
  - there are 20 lectures
  - missing lectures (rounded down) will result in a final grade penalty
    - 2-3 missed lectures = 1 letter grade reduction
    - 4-5 missed lectures = 2 letter grade reduction
    - 6-7 missed lectures = 3 letter grade reduction
    - 8-9 missed lectures = 4 letter grade reduction.

Studio – Be Prepared

- Review appropriate lecture material
- Review appropriate studio material
- Engage in studio
- Your studio instructor is grading you
- Studio Preparedness = 10% of your grade
- Class Participation = 5% of your grade

Science and Engineering

- Scientific Method
  - Theory corrected by experiment.
- Engineering Method
  - Ordered sequence descripting the morphology of engineering design
  - Ordered sequence in descriptions of engineering problem solving.
  - Application of scientific principles to solve problems.
  - Incorporates the use of
    - engineering heuristics
    - heuristic reasoning
  - within the context of a
    - logical, ordered, and systematic procedure
    - plan for solving engineering problems effectively and efficiently.

Engineering

- Engineering Method
  - Strategy for causing the best change in a poorly understood or uncertain situation with the available resources and using heuristics
  - (Heuristics are anything that provides a plausible aid or direction in the solution of a problem, but is, in the final analysis, unjustified, incapable of justification and fallible; a.k.a.; engineering concept, rule of thumb, safety factors, orders of magnitude)
- Engineering is the process of manipulating nature to benefit society
  - Manipulating is decision making, not problem solving.

Characteristics of Design

- Multi-stage - hierarchical decomposition
- Large quantities of data - modularized
- Support design tools - analysis, optimization, simulation, etc. - in various design phases
- Uncertain design path
- Alternatives, revisions, versions
- Iterative and cyclic
- Teamwork - interactions between designers
- Multidisciplinary
- Dynamic.

Questions to Ask When Designing

- Where can I sell my product?
  - What products do my customers need?
- How can I improve my product?
  - What customer needs are not being met?
- When will my product become obsolete or inappropriate?
  - How are changes in technology affecting the marketplace?

Critical Information

- Studios (labs) are being held this week
  - Read the studio handout posted on the ME 2110 web site
- Do not miss your studio section
- Competition date 9 November 5 PM
- Final reports / presentations the week of 12 November
- Thanksgiving, 22 November

Some Advice

- Understand the world
- Get to know your TA and instructor
- Know where you are going
- Learn your material, it is valuable ($$$)
- Learn to tell your story, this course will land you a job
- You learn more from failure than from success
  - Fail often
  - Understand your failure mode
- Prototypes
  - Build
  - Run
  - Fatigue