ENGR 199 Midterm Exam

Exam objectives: For this exam you should be able to describe, and use:

- the stages in Voland's the design process
- the general characteristics of all design processes
- the key characteristics of a design memo
- an example memo section (including creating or correcting)
- current design practices:
  - Life-cycle design
  - Design for manufacture
  - Design for quality
  - Faster design cycles
  - Engineering without walls
  - Design for export
- different types of needs
- overall problem goal finding processes (e.g. Statement/Restatement, Why-Why Diagrams, …)
- KT Situation and Problem Analysis
- Duncker diagrams
- general project goals
- specific project goals
- development of specifications (including types of specifications and key characteristics of a specification)
- derivation of metric units
- different types of models (iconic, anologic, symbolic <> graphical, qualitative, quantitative ...).
- a provided mathematical model including looking at units, assumptions, and principles.
- find simplifications or simple relationships from a mathematical model
- simplify a model using a lumped-parameter approach
- unit analysis (checking units, evaluating the conceptual basis of an equation, deriving a likely proportionality from units).
- metric unit prefixes
- application of the Bernoulli equation to simple circumstances (complete equation provided).
- analysis using force-distance relationships (developing simple relations based on conservation).
- develop a relationship from a general concept
- ~~approaches for protecting intellectual property~~
- ~~advantages and disadvantages of Trade Secret, Trademarks, Copyrights, Patents~~
- ~~types of Patents~~
- ~~key criteria for a Utility Patent~~

- Exam will be Monday, March 3rd.
- Closed book and notes.
- One 8.5"x11" sheet of notes allowed (must be your own, to be turned in with exam)
- Chapters 1-6 in Voland plus lecture material will be included

You should be able to describe or identify the major story and the key points of the various case studies. The case studies covered are listed on the back of this sheet.

Case Studies covered:

- 1.1 The Early Quest for Manned Flight
- 1.2 The Wright Brothers' Success in Manned Flight
- 1.3 Refining the Typewriter
- 1.4 Single-use camera
- A Typewriter for the Blind (p. 55)
- The DC Heart Defibrillator (p. 56)
- The Kwik-Loc Closure (p. 57)
- The Quick-Release Ski Binding (p. 58)
- Color Printing & Air Conditioning (p. 58)
- 2.1 Kidney Dialysis Treatment
- 2.2 Credit Cards for the Blind
- 2.3 Cleaning Up Oil Spills
- 2.4 Durable Pants for Miners
- 2.5 Garrett Morgan's "Safety Hood" and Traffic Signal
- 2.6 Lake Peigneur
- 2.7 Flixborough Explosion
- 2.8 DC-10 Crash
- 2.9 Bhopal
- 2.10 Teton Dam
- Lawn Mowers/yo-yos (p. 89)
- Reentry of Space Capsules (p. 91)
- 3.1 The Tylenol Case
- Laminated Glass for Automobile Windshields (p. 123)
- Shopping Cart Security Systems (p. 126)
- The DC-8 Crash (p. 128)
- The Hubble Space Telescope Failure (p. 129)
- The Mianus River Bridge Collapse (p. 131)
- Coca-Cola's BreakMate (p. 133)
- Mars Climate Orbiter (p. 136)
- The Sinking Boat (p. 139)
- Jungle Landing (p. 147)
- 4.1 Improper Waste Disposal (Love Canal, Times Beach)
- 4.2 The Collapse of Baldwin Dam
- 4.3 Perrier Water
- 4.4 The Pentium Computer Chip
- 4.5 Two Routes to Simplicity: Camcorder Redesigns
- 4.6 O-Rings and the Challenger Disaster
- 4.7 Fax Machines
- 4.8 The Development of Band-Aids
- 4.9 The Ergonomically Designed Lounge Chair
- Coin Testers (p. 172)
- Elevators (p. 174)
- Eyeglasses (p.182)
- Acoustical Design of Concert Halls (p.184)
- Incandescent Electric Lights (p. 187)
- Electric Motors (p. 189)
- Air speed Indicators (p. 189)
- ~~Uneeda Biscuits' Slicker Boy (p. 198)~~
- ~~The AT&T Blue Bell (p. 199)~~