Engineering Innovation
Johns Hopkins University

EN500.110 "What is Engineering?"

Syllabus

From a fundamentals point of view:

1) Dimensions, units, and dimensional reasoning
2) Approximations in engineering, dx vs. Δx
3) Concepts and applications of "conservation"
    a) mass and energy balance
    b) Kirkhoff's law
4) Concept and applications of zero as a condition, e.g., $\sum forces = 0$ in structures and static systems.
5) Boolean algebra.
6) Errors, their propagation and analysis. The total derivative.

From a substantive point of view:

1) Strength/behavior of materials
2) Statics/structures
3) Uncertainty, statistics, measurement
4) Robotics
5) Digital logic/circuitry
6) Separation processes
7) Diffusion, heat transfer

From a "process" point of view, i.e., what an engineer does

1) Communication
    a) proposal presentation (response to an RFP, PowerPoint)
    b) development of assembly/construction plans (mousetrap design, 3-D Engineering drawing software [2009 option])
    c) reporting and interpreting of laboratory results
    d) research synthesis (written)

2) Project management
    a) time/team management
    b) design
    c) construction

d) testing

3) Experimentation
   a) measurement
   b) application of principles
   c) application of data

4) Tools
   a) approximation
   b) statistics
   c) computer software
      i) simulation
      ii) spreadsheet/presentation
      iii) graphics/drawing
      iv) 3-D engineering drawing [2009 option]
      v) Matlab [2009 option]

From a "project" point of view:

1) Design and build a spaghetti bridge to specification
   a) properties of materials lectures
   b) materials testing laboratory (spaghetti)
   c) lectures on the theory of structures
   d) design a truss using simulation software
   e) build the bridge
   f) test the bridge

2) Design a mousetrap using paper, glue, and rubber bands. The mouse is a ping-pong ball. Produce assembly instructions. [Option: use any 3-D drawing software to sketch assembly drawings.]

Further details:

Lectures,presentations, lab assignments, projects, written/oral assignments, sample problems, and sample exams can be found at http://engineering-innovation.jhu.edu/course-description/.