ME 1065: Group Design Project
Fall 2008

Each design group in the class will complete a similar, but slightly different design project. For this project, each group will choose one of four types of buildings:

1) Single-family home (in any kind of neighborhood)
2) Apartment Building or Dormitory (any location – rural, urban, etc.)
3) Stand-alone Commercial Building (store, spa, etc.)
4) Office Building (multiple tenants, multiple use)

These buildings will be located in one of three different climate zones:

1) Northern,
2) Moderate, or
3) Southern

These climate zones are loosely defined; "northern" could mean Maine, Oregon, Greenland, Siberia, etc., "moderate" could mean California, Hawaii, Spain, etc., and "southern" could mean Florida, Arizona, Italy, Tunisia, etc.

Each of these buildings, like most buildings, has three possible energy input sources:

1) Electricity
2) Natural Gas
3) Water

Depending on their location, the buildings can also take advantage of any natural resources, including:

1) Sunlight
2) Wind power
3) Water power
4) Geothermal

Although this may vary slightly by the building type, purpose, and location, there are certain basic needs (which may vary by time of day and month of the year) that must be met for the occupants:

1) Lighting
2) Climate Control and Ventilation
3) Hot water (bathrooms, sinks)
4) Appliances (dishwashers, computers)

Your overall project is to design and analyze a system that will meet those needs.

For Part 1 of the Design Project:

1) Specifically locate, define, and provide a general layout for your building.
2) Quantify the energy needs for the occupants of the building.
3) Design a system (or systems) that provides for those needs in an efficient manner. The systems can utilize conventional or cutting-edge components, and can be standalone or interconnected.
    a. Sketch all of the components of the systems: pipes, heat exchangers, pumps, power lines, gas lines, ventilation ducts, water inflows and outflows, etc.
    b. Perform a thermo-fluid, system-level analysis on any system or subsystem that utilizes heat transfer or fluid flow. Determine the relevant state variables at all transition points in your systems.
4) Quantify the efficiency (or various efficiency factors) of your building.

The written report for Part 1 is due on October 14, and is worth 15% of your grade.

For Part 2 of the Design Project:

(More details will be provided later in the semester)

Provide detailed design specifications for three types of components in your system:

1) Pumps
2) Piping Networks
3) Heat Exchangers

These design specifications should include configurations and sizes, material types, and (where relevant) performance curves or manufacturers' data.

Additionally, other thermo-fluid components in a system will need to be described in more detail than in Part 1 (such as wind turbines, photovoltaic cells, etc.). These will be discussed with the individual groups on a case-by-case basis.

The written report for Part 2 is due on November 10, and is worth 15% of your grade.

For Part 3 of the Design Project:

(Again, more details will be provided later in the semester)

1) Analyze the economic and environmental impacts of your building.
2) Describe improvements that can be made to your original design to reduce those impacts.

The written report for the cumulative project, which includes Part 3, is due on December 1, and the oral reports will be given on December 1 and 3. Together, these are worth 15% of your grade.