ECE 465: Realistic Sustainable Energy

**Concepts:**
- Energy units including: BTU’s, Watt-hours, Joules and conversion factors between them.
- Energy Transport costs for both freight and people. Hybrid Electric truck, bus and car issues.
- Energy sources for Transport.
- Imbalance between energy costs and sources and its implications.
- Alternative Sustainable Energies are covered in depth including: Solar, Wind, Hydro and Geothermal.
- Shortcomings of alternative energies in terms of capacity factors, cost and reliable interfaces to the electric grid.
- Need for fossil fuels for peak loading and as backup for alternative energies.
- Laws of Physics are contrasted to laws of man. The later include: role of tax breaks, government grants and loans, government mandates and feed in tariffs for alternative energies.

**Applications:**
- Solar and wind farms as well as large scale hydro and their environmental impacts.
- Niche applications of hydro, wind and solar energies that are cost effective without subsidies or mandates.

**Tools:**
- Use of Power Point and Word to prepare semester group presentations.

**Absolutes**
- Freshman Physics.
- Freshman Calculus.
- Basic familiarity energy systems of energy.

**Flexibles**
- Sophomore Circuits.
- Basic Thermodynamics.
- Freshman Chemistry.

**OUT**

**Double Entry Energy Accounting**
- Energy use in transportation, HVAC and electric generation is detailed in units of kW-Hr.
- Alternative Energy sources for fuels and electric generation are covered including: biofuels, gas and coal to liquid fuel conversions as well as wind, solar and hydro.
- Backup power to achieve 24/7/365 operation coverage includes: nuclear, and all hydrocarbon sources.
- Concepts of ‘Negawatts’.

**Unproven Alternatives**
- Geothermal heat and power generation possibilities.
- Wave and tidal power generation possibilities.
- Role of heat pipes in modern HVAC systems.
- Recycling as a form of energy conservation.