

ECE 465: Realistic Sustainable Energy

IN

OUT

Absolutes

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

Flexibles

- Sophomore Circuits.
- Basic Thermodynamics.
- Freshman Chemistry

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.

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