Introduction to Sustainable Energy Systems

GSVS 2050 / ENGR 2050

3 credits, No college prerequisites

Energy System Foundations (3 of 28 classes)

Energy, power, units, orders of magnitude, First and Second Laws of Thermodynamics, Energy system examples. *Key images*: Energy system, Energy systems as sociotechnical systems.

Energy Systems, Climate Change and Human Health (3 of 28 classes)

Fossil fuel energy system emissions, Global emitters (today, tomorrow), The carbon cycle, The greenhouse effect, Power plant emissions and human health.

Energy System Economics (3 of 28 classes)

Levelized cost of electricity, Early stage government support for R&D, Economies of scale, Stranded assets, The Social cost of carbon, Labor.

Governance and Energy Systems (3 of 28 classes)

Federalism, Forms of Government (Republic, Oligarchy), Checks and Balances, Political ideology and government policy, The interplay of environmental and energy policy, International governance, Energy and private sector action. *Key image*: The spectrum of political ideology

Electricity Science (2 of 28 classes)

Electromagnetic induction, Voltage, Current, Resistance, Voltage drop and Power = Current x Voltage, Semiconductors, P-N junctions, The photovoltaic effect.

The Electricity Grid (8 of 28 classes)

Electricity generators / motors, AC / DC, Solar Cells / LED lighting, Historical development of the U.S. electrical grid (providing entities, regulating entities, deregulation, markets). Sustainable generation technologies, Transmission and Distribution, The electricity grid structure of major global emitters

Emerging Energy System Innovations (2 of 28 classes)

Energy storage, Energy efficiency, Super / smart grids, Distributed energy resources, Electricity in the developing world

Energy Sector Consumption (4 of 28 classes)

Transportation (electricity and liquid fuels), industry (energy intensive, high temperature, food), commercial and residential (HVAC, water heating, lighting)

<u>Learning Points of Emphasis</u>

Vocabulary

~200 terms

Calculations

Personal energy audit conversions (kWh to carbon footprint, gasoline consumption to carbon footprint), Levelized cost of electricity, Voltage drop in a wire, The transformer relationship, Power generation from a hydro turbine system, a wind / water turbine system, and a solar photovoltaic system.

Personalized learning paper

750 word prospectus, 3000 word final