EE180J: Advanced Renewable Energy Sources. Spring 2015
HOMEWORK #1: Energy and Power. Due April 10, 2015
100 points total

Name: _____ Student ID#_____

We get energy from many different sources. Some are fuels that we extract by mining, and others are natural energy flows that we can trap.

1. List five sources of energy (10 pts.)
   Wind, solar, petroleum, coal, natural gas, waves, tides, etc

2. What is a renewable energy source? (5 pts.)
   A renewable energy source is one that contributes less pollution and is not depleted by use.

3. How does energy use affect the environment? Give at least three examples and explain how the environment is affected.(8 points)
   a. air pollution by using coal, particulates as well as carbon emissions
   b. can reduce animal population like fishes by using hydropower
   c. destroying the forests by cutting trees for fuel, not only reduces carbon sequestration capacity but also puts pollution back into the atmospshere
   d. Sound pollution

4. Define energy in your own words? What are the units? (5 pts.)
   Energy is the amount of force exerted over a distance, dW = Fds
   Units of Kgm^2/sec^2 or Joules

5. Define power in your own words? What are the units?(5 pts.)
   Rate of energy use, or energy/unit time
   Units of Joules/sec, Watt

6. Convert the following quantities to the units shown. (3 pts.)
   a. 1 kJ to Wh = 0.2778 Wh
   b. 10,000 Btu to MJ = 10.55 MJoules
   c. 1kWh to MJ = 3.6MJoules

7. How much energy in kilowatt-hours is consumed by a 1000 W microwave oven used for 5 minutes? (10 pts.)
   P = E/t, E = Pxt = 1000W x 5 min = 1kWattx5/60 hr = 0.0833 kWhr

8. A clock radio consumes 240 Wh of electrical energy over a day. What is its power consumption? (10 pts.)

   P =E/t = 240Whr/24hr = 10Watts

9. If a refrigerator uses 2kWh of electricity per day and operates on the average only 20 minutes per hour, what is the power rating of the refrigerator motor? (10 pts.)

   P = E/t P = (2000Whr/day)/ (1/3 x24hrs/day) = 250 Watts

10. A sewing machine rated at 75 W consumes 675 Wh of energy over a week. How long was the machine used over the week? (10 pts.)

    T =E/P =675Wh/75W = 9hr

11. What are three examples of energy consuming technology around your home? (3 pts). For these three determine : (21 pts.)
    a. What is the type of the input energy?
    b. What is the type of the output energy?
    c. What is the type of the energy losses?

    Examples:

Items	car	lamp	Fridge	dish washer
Input energy	chem. Energy	electrical	electrical	electrical
Output	mechanical	electromagnetic	thermal	mechanical
Losses	thermal	thermal	thermal	thermal
	"Rolling resistance" drag	non-vis light electrode loss	chemical electrical	water pollution sound pollution