Department of Building, Civil and Environmental Engineering

ENGR 202: SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL STEWARDSHIP (SUMMER 2015, AA)

Assignment No. 1 (Due date: May 20, 2015)

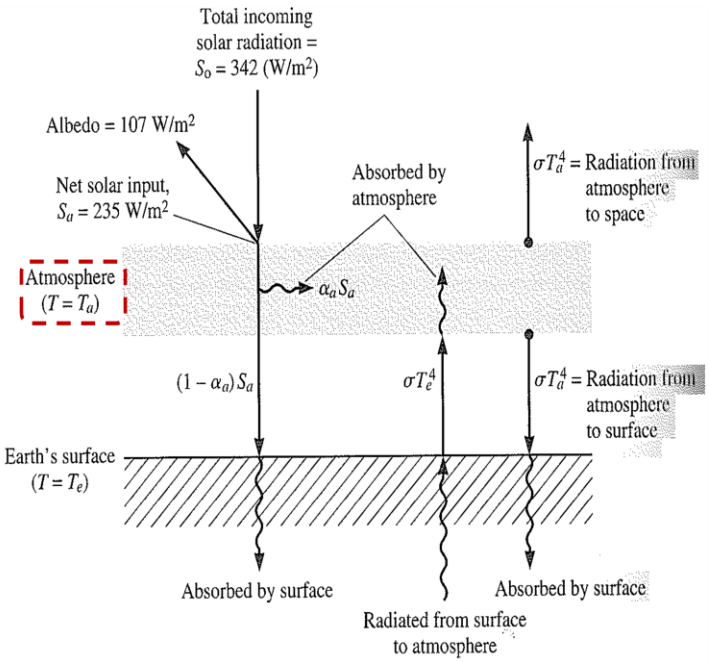
Note: submit before class starts.

1. Select one major product or process associated with the field of engineering you are studying. Briefly describe the type of environmental impacts that may arise from either the manufacturing or use of that technology (Use about 200 words or less.).

2. Following equations (1) and (2) describe the energy balance for the simplified earth's atmosphere shown below. Derive these two equations and solve them to find the earth's surface temperature. Use the numerical values of solar input, albedo, and atmospheric absorptivity given in the text.

$$S_a a_a + \sigma T_e^4 = 2\sigma T_a^4 \quad (1)$$

$$Sa(1- a_a) + \sigma T_a^4 = \sigma T_e^4 \quad (2)$$



3. Estimate the increase in radioactive forcing from methane if its atmospheric concentration were to increase from 1720 ppb to 1800 ppb over the next 50 years.

a. Ignore the methane-nitrous oxide overlap term.
b. Include the overlap term in your calculation based on a constant N_2O level of 312 ppb. How much of the difference does this make?

4. Assume that anthropogenic CO_2 emissions increase rapidly over the next 100 years, leading an exponential increase in atmospheric CO_2 concentrations given by $C = C_o e^{0.01t}$, where t is the time (in years) and C_o is the initial CO_2 concentration at t=0, equal to 360ppm.

a. Plot the CO_2 concentration from t=0 to 100 years.
b. Estimate and plot the resulting increase in radiative forcing over the same period.