# Homework #4

## Web Problem #4
## Nuclear Reactor Design and Analysis

1. For a spherical, pure $^{235}U$, water-moderated reactor that is 4 ft in diameter, and a fuel to moderator ratio of .00345, find the multiplication factor. Assume a two group model with group one having energies from 10 MeV to 1 eV, and group two having energies from 1 eV to .025 eV. Actually calculate the value for the resonance escape probability, but assume a fast fission factor of approximately 1. Any cross sections should be energy-averaged values taken from the latest ENDF libraries.

2. **Team Problem:** Using a two-group model similar to the one described in class, evaluate a minimum radius for your Reactor, assuming it is homogenous an exactly critical. Use energy averaged cross sections for the appropriate energy bins, and make energy bins for 1) thermal neutrons (up to 1 eV) and 2) all other neutrons. If you haven't yet picked the fuel or an enrichment or concentration of fuel for your core, use this exercise to identify (or at least "guesstimate") the desired value based upon an ideal (based upon your functional requirements) core radius.

3. **Team Problem:** Approximate the flux profile in your chose reactor assuming a bare, homogenous, one-group neutron flux. Where appropriate, please include appropriate assumptions, parameters, and correlations used in this process. With this profile you obtain, please, approximate the following:
    a. The neutron flux (and thus fluence) on the edge of your reactor.
    b. The peak flux and peak power in your reactor.
    c. The burnup rate in your reactor, in MW/kgHM.