ESR 320
ENVIRONMENTAL SYSTEMS I
THINGS TO KNOW FOR THE FIRST MIDTERM

Exam is **OPEN NOTES/READINGS**. Don't memorize details but know exactly where to find them. Also, work on knowing exactly where to find an important equation or example in your notes. In an exam, you will need to quickly find just the thing you need, so review all your notes/readings and mark helpful pages with post-its and highlighter.

That said, some things are worth memorizing, or having right at the tip of your fingers in a "cheat sheet": Know how to **convert** all the common **metric** units among the various forms. For example, mg to g to kg to metric tonnes; m^2 to hectares; L to m^3; etc. Practice this so it is second nature and you do not have to look it up. Quick: How many square meters in a hectare??

In general, whatever we discussed in class (other than some minor "fun fact" discussions) is fair game to appear on the exam.

Know or be able to quickly access the **vocabulary** associated with everything we have been covering since the last midterm. E.g., know or find definitions of various terms we have used. *Some* examples might be: orographic lifting, convection, latent heat, incompressible fluid, cloud condensation nuclei, dew point, inversion, adiabatic. (Look in your notes and reading for other such terms we used in class.)

Know the basic **definitions of physical properties** we have been working with. I will not necessarily ask you for a definition, but I will expect you to know what a particular property means. For example, know (memorize) that pressure is defined as force per unit area; density is mass per unit volume; volumetric flow is volume of fluid per unit time, work is force time a distance, and of course, $pV = nRT$.

Be prepared to do some **calculations** based an equations we specifically used in class, in the lab, and especially in Problem Sets 1 and 2. Bring a decent scientific calculator (something that can perform exp and trig functions.

<u>Simple Calculations you should be ready for</u>:

Be able to calculate the velocity or flow (discharge) of a river using $Q = vA$ (flow equals fluid velocity times cross-sectional area) and some given data.

If you are given an evaporation rate, you should be able to calculate the associated heat flux. (Multiply the mass loss via evaporation times the latent heat of vaporization.)

You should be able to do other simple phase change calculations, like the amount of heat transfer it takes to freeze or melt a certain mass of ice.

Be able to calculate the temperature and pressure at a certain altitude if given information about a reference altitude and atmospheric conditions.

Given a heat flow into or out of a certain mass of water, be able to calculate the change in temperature that results.

Be able to predict the altitude that a cloud will begin to form if given info about the dew point and the atmospheric lapse rate.

Be able to do simple interconversions of energy. For example, if the potential energy of an object changes (say, it falls a certain distance), calculate the amount of kinetic energy the object now possesses. Or, suppose an object moving with a given velocity is stopped by frictional drag, what is the amount of heat energy that is generated.

Other skills you should have:

If I give you a graph of the actual lapse rate of the air and the dry adiabatic lapse rate, be able to indicate the areas of atmospheric stability or instability. Or, be able to roughly sketch what a plum of smoke from a smokestack my do in those conditions (mix strongly, or not at all, or be trapped, etc.)

Know the three general ways (types of lifting) that cause clouds and precipitation to form.

Know some of the limitations of the various measurement devices we have discussed (like rain gages, evaporation pans, weirs.)