Department of Civil and Environmental Engineering 24 June 2013
Stanford University
CEE 70 – Environmental Science and Technology (Engr 90 Cross Listed)

Time and Place:	Monday through Thursday 3:15 to 4:05, Y2E2 111
Instructor:	Royal Kopperud kopperud@stanford.edu
Office Hours:	Y2E2, time and location to be announced
Teaching Assistant:	Xing Xie <xiexing@stanford.edu>
Textbook:	Introduction to Environmental Engineering and Science, 3rd Edition, Prentice-Hall 2008, Gilbert M. Masters and Wendell P. Ela. Available at the bookstore and on reserve at the Engineering Library.
Homework:	**20% of Final Grade** Homework sets handed out approximately weekly, due 1 week later. Homework is due before class begins and may be submitted in class or in the drop box at Y2E2 (Yellow Atrium Basement - Shelves). Although you may work together in groups of 2 or 3 to develop your understanding of the homework questions, your submitted homework must be a product of your own effort and must represent your own understanding. **Observe the Honor Code in preparing your homework.**
Exams:	**4 tests, 20% each. In class 8 July, 22 July, 5 August, and during the final exam period 7 to 8 PM, Saturday August 18th. Each test will be 50 or 60 minutes, depending on room availability. <u>Please let me know as soon as possible if you have another class Monday at 4:15 so that we can schedule the tests.</u>**

The summer coordinator, Colin Ong, would like all students taking any of our summer classes (Stanford as well as Visiting) to register with him so we can contact everyone for our extra activities which will include field trips and socials. The registration form is at:

http://www.stanford.edu/group/ees/summer/forms/appform.fb

[Please note that the above registration is NOT REQUIRED, merely optional.]

Topic Outline (Readings from IEES 3rd Ed.) Dates are approximate.

Mass and Energy (pp. 1 - 35) 6/24-26
- Ideal gas law
- Mass balances
  - Steady-state
  - First-order decay
- Energy balance
- Heat capacity and heat of vaporization
- Energy efficiency

Chemistry (pp. 47-70) 6/27-7/1
- Stoichiometry
- Reaction enthalpy
- Equilibrium constants and pH
- Read and understand alpha-diagrams

Population Growth (Ch 3 especially pp. 87-94, 106-120) 7/2
- Exponential growth
- Half life and doubling time
- Human population dynamics

Risk Assessment (Ch 4 especially pp. 145-157) 7/3-7/9
- Potency Factor or Oral Slope Factor
- Drinking water unit risk / Inhalation unit risk
- Drinking water equivalent level at 10^{-4}, 10^{-5}, and 10^{-6} risk
- Inhalation unit risk
- RfD, hazard quotient, and Hazard Index

Water Pollution (Ch 5, especially pp. 199-226, 229-240) 7/10-11
- Biochemical Oxygen Demand
- ThOD, BOD_5, CBOD, NBOD
- Rate constants and temperature dependence
- Streeter-Phelps oxygen sag curve

Lakes (pp. 219-226) 7/15
- Algae and limiting nutrients
- Oligotrophic, mesotrophic, and eutrophic lakes
- Thermal stratification

Groundwater (pp. 229-244) 7/16
- Porosity
- Hydraulic gradient
- Darcy's Law, Darcy velocity
- Average linear velocity and retardation

Water Quality (pp 289-295, 299-302, 314-332) 7/17-18
- Safe Drinking Water Act
- Maximum Contaminant Level (MCL) and MCL Goal (MCLG)
- Treatment Technique (TT)
- Secondary Standards
- Basic wastewater unit operations

- Settling and Stoke's Law
- Settling basins
- Combined and separate sewer systems

Air Pollution (Skim pp. 367-384; 389-393; skim 394-426; 426-428; 437-438; 438-450; 450-458; 483-end of ch.7) 7/22-30

- Criteria Pollutants
- Air Quality Index (AQI)
- Carbon monoxide
- Stokes Law
- Atmospheric stability
- Ozone
- Automobile pollution
- Gaussian dispersion
- Box model - steady state and transient solutions

Global atmospheric change (Skim pp. 502-512; 512-536; skim 536-545; 545-551; 554-558; 574-587).....7/31-8/13

- Energy balance and radiation
- IR window
- Albedo
- Climate sensitivity
- Global Warming Potential (GWP)
- Stabilization wedges
- Chlorine and stratospheric ozone

Review, wrap up 8/14-8/15