Preliminary Exam for First Year PhD Students

Purpose (from the UCR General Catalogue)

The purpose of the preliminary examination is to test students' understanding of the fundamental principles of chemical and environmental engineering at the **undergraduate** level. For each student, this comprehensive examination consists of **three** written tests in areas selected from the following five subjects:

1. **Thermodynamics**
2. **Kinetics**
3. **Transport (heat and mass transfer, fluid dynamics)**
4. **Air pollution control and engineering**
5. **Water quality engineering and waste management**

The three subjects selected **should be closely connected to the student's undergraduate training and approved by his/her advisory committee**. Students who fail all three subjects on the preliminary exam must leave the Ph.D. program. Students who fail one or two subjects of the exam are granted a final attempt to pass a makeup written examination that includes an oral defense of their answers in front of a faculty committee.

Schedule:

The exam will be located in Bourns A265. The schedule will be as follows:

6/25/12: Transport (9 - 11 AM), Water (1 – 3 PM)
6/26/12: Kinetics (9 – 11 AM), Air (1 – 3 PM)
6/27/12: Thermodynamics (9 – 11 AM)

The re-test (if necessary) will be located in Bourns A265. The schedule will be as follows:

7/9/12: Transport (9 - 11 AM), Water (1 – 3 PM)
7/10/12: Kinetics (9 – 11 AM), Air (1 – 3 PM)
7/11/12: Thermodynamics (9 – 11 AM)

Exam Information:

The specifics will be finalized after you have decided which subjects to test. The topic selection form has been sent to you via e-mail. Please turn in the completed form no later than Friday, May 18th. If your form is not turned in by the deadline, the subject selections will be made for you.

The exam will begin at 9am*. Please arrive at least five minutes early. Once the exam starts the door will be closed and you will not be admitted.*

This is an open book exam; you are allowed to bring **one** textbook per subject area (see attached for suggested texts). **Notes are NOT allowed**. You will have two-hours of testing time for each subject.

There are **3 problems** for each subject; all of them need to be answered. You must provide your own paper and writing utensils.

The faculty will grade your exams and you should have the results within one week.

Suggested Undergraduate Texts

Thermodynamics

- J. M. Smith, H. C. Van Hess, M. M. Abbott, Introduction to Chemical Engineering Thermodynamics, 7th edition (2005), McGraw-Hill.
- Stanley I. Sandler, Chemical and Engineering Thermodynamics, 3rd edition (1998), John Wiley & Sons.

Kinetics

- H. Scott Fogler, Elements of Chemical Reaction Engineering, 3rd Edition(1998), Prentice Hall PTR.
- Octave Levenspiel, Chemical Reaction Engineering, 3rd Edition(1998), Wiley

Transport

- R. Byron Bird; Warren E. Stewart; Edwin N. Lightfoot, Transport Phenomena, 2nd Edition (2001), John Wiley & Sons
- James Welty, Charles E. Wicks, Robert E. Wilson, Gregory L. Rorrer, Fundamentals of Momentum, Heat, and Mass Transfer, 4 edition (2000), Wiley
- J.P. Homan, Heat Transfer, 9th edition, McGraw Hill

Air pollution control and engineering

The most relevant courses are ENVE 133 and ENVE134. The textbooks that best represent these courses are

Wark and Warner, Air Pollution: Its Origin and Control
Cooper and Alley, Air Pollution Control: A Design Approach

Water quality engineering and waste management

Relevant undergraduate courses for water quality engineering and waste management: ENVE 171, ENVE 142, ENVE 146, ENVE 120, ENVE 121

Standard textbooks:

- Masters, G.M. (1998) Introduction to Environmental Engineering and Science, 2nd ed., Prentice Hall.

- Tchobanoglous, G. and E.D. Schroeder (1985) Water Quality: Characteristics, Modeling, Modification, Addison-Wesley Publishing

- Montgomery Watson Harza (MWH) (2005) Water Treatment: Principles and Design, 2nd ed., John Wiley & Sons

- Metcalf & Eddy, Inc. (2003) Wastewater Engineering: Treatment and Reuse, 4th ed., McGraw-Hill.

- Reynolds, T.D. and P. Richards (1996) Unit Operations and Processes in Environmental Engineering, PWS Publishing

- Rittmann, B.E. and P.L. McCarty (2001) Environmental Biotechnology: Principles and Applications, McGraw Hill

- Benjamin, M.M. (2002) Water Chemistry, McGraw Hill, 2002.

- Stumm, W.L. and Morgan, J.J. (1995) Aquatic Chemistry: Chemical Equilibria and Rates in Natural Waters, 3rd ed., J. Wiley & Sons

- Morel, F. and Hering, J. (1993) Principles and Applications of Aquatic Chemistry, Prentice Hall