HSCI 514
RADIATION INSTRUMENTATION LABORATORY
Spring 2009

Instructor:
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Course Description:
This course introduces laboratory techniques required for the handling of radiation and radionuclides. Practical aspects of radiation monitoring using various instruments, instrument calibration, radiation fundamentals and statistics will be covered.

Course Webpage:
https://courses.pnhs.purdue.edu/hsci514/

All course related materials and announcements are available on the course webpage listed above. Lab sheets, lectures and assignments (when applicable) can be downloaded each Friday before class.

Lab:
Experiments will be performed usually in groups of two to three. You should choose a laboratory partner/group. For most laboratory periods there will be an introductory lecture and a brief discussion and explanation of the experiment to be performed. A quiz will also be given at the beginning of each laboratory period covering last week’s lab and introductory material for the present day’s lab (or a lab in which no quiz was given). There may be some experiments or parts of experiments that cannot be adequately done as a group within the scheduled laboratory period. For these, you and your partner (or small group) will need to schedule a time during the week to do the work (when I am also available). The extra time spent outside of the scheduled laboratory will be compensated one way or another. In some instances, there will be weeks without labs, or small groups will alternate between weeks to perform labs due to insufficient numbers of instruments.
Lab Reports:
Each student is required to submit a report for each lab performed. Lab reports are due one week after the experimental work is completed. They are to be handed in at the beginning of the next lab period. If a student forgets to bring in the lab report to class, it may be submitted by email within 2 hours from the end of the class, without penalty. Late reports after this time should be submitted directly to me or put into my mailbox in CIVL 1263. Points will be deducted for late submission. Please see me if you need to turn in your lab late.

Lab reports should be neat, organized, and concise. Your reports must be typed, except where impractical. An ideal lab report should consist of:

1) A title sheet that contains:
   a. title of the experiment
   b. day and date of experiment
   c. lab section
   d. your name
   e. partner’s name when working in pairs or groups

2) Brief description of procedure
3) Neatly tabulated data
4) Calculations whenever necessary
5) Graphs if necessary
6) Results and Conclusions
7) Answers to questions, if any, on the information sheet
8) Comments or reasons for anomalous data obtained

You may work on the reports with your lab partners, but the final write-up must be in your own words.

Attendance:
Lab attendance is mandatory. See Ulrike Dydak if it is necessary for you to miss a lab for an excused reason. Labs can not be made up unless they are during the other lab section on the same day. Because of this, the lowest quiz and lab report score will be dropped. The following rules apply to absences and late reports:
1. Excused absentees may hand in their reports 1 week after the original due date without penalty.
2. Unexcused absentees who submit reports will have that lab report grade reduced by “50” percentage points. (So you will start with a “50” before it is even graded)
3. Unexcused absentees who do not submit reports will receive a “0” grade for that lab report.
4. Late lab reports will result in the reduction of “10” percentage points for that lab for each day late.
Lab Grades:

Ten (10) points may be earned for each quiz and laboratory experiment report. Final grades will be based on the following percentage breakdowns:

1) Lab reports – 55%
2) Quizzes – 25%
3) Final Lab exam – 20%

The average required for your final letter grade will be determined after all averages have been computed. However, you are guaranteed a letter grade indicated by the following:

≥ 90 – A  ≥ 80 – B  ≥ 70 – C  ≥ 60 – D  ≥ 50 – F

For the purpose of final grading, fractions of a percentage will **not** be rounded up.

Text:

None

Campus Emergencies:

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances. In such an event, all information about changes in this course will be posted on the course webpage.
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SYLLABUS

1. Radiation Instrumentation Overview
2. G-M Survey Meter Introduction and Calibration
3. G-M Survey Meter Characteristics
4. Radiation Safety Training
5. Counting Efficiency and Backscattering
6. Beta Particles (Ranges)
7. Gamma Ray Scintillation Spectrometry (Part I)
8. Gamma Ray Scintillation Spectrometry (Part II)
9. Germanium Gamma-Ray Spectrometry (Group 1)
10. Germanium Gamma-Ray Spectrometry (Group 2)
11. Radioactive Decay Statistics
12. Liquid Scintillation Counting
13. Review for Final / Visit of Research Reactor
GENERAL PRECAUTIONS TO BE OBSERVED IN A RADIONUCLIDE LABORATORY

1. No smoking, eating, drinking, or application of cosmetics is permitted in a radionuclide laboratory. Gum chewing may not be permitted at some places.

2. No storage or preparation of food is permitted in a radionuclide laboratory.

3. Never pipette radioactive solutions by mouth. This is also a good rule for any caustic or toxic material. There are ways to remotely pipette anything.

4. Use protective gloves whenever working with unsealed sources. Usually disposable plastic gloves are used.

5. Clothing covering all skin, except for the face and hands, must be worn. Shorts and open toed shoes are not permitted when working with open sources.

6. A laboratory coat must be worn in the laboratory but not outside of the laboratory.

7. Safety glasses must be worn when eye contamination is possible.

8. Always work in a hood if there is any chance of radioactivity becoming airborne (volatile materials, fumes, dusts, mists).

9. Appropriate monitoring equipment must be available and operating at all times. Survey meters, portable and/or stationary, must be calibrated.

10. Personnel monitoring devices must be worn when needed. These include a film badge, a ring badge, or a pocket dosimeter. Students in teaching labs are exempt.

11. A caution label must be placed on all storage or unattended containers actually containing or contaminated with radioactivity until cleaning can be performed.

12. Use absorbent paper and trays to minimize potential decontamination problems. Paper is expensive. Use Kleenex or paper towels on absorbent paper when appropriate.

13. Always monitor your hands (and feet) before leaving the laboratory.

15. Report accidents, spills, etc. to the instructor immediately.

16. Use common sense!