Eastern Illinois University
New Course Proposal
CHM 1440, Chemistry Research Rotation

Please check one:  x New course  □ Revised course

PART I: CATALOG DESCRIPTION

1. Course prefix and number:  CHM 1440
2. Title:  Chemistry Research Rotation
3. Long title, if any:  N/A
4. Class hours per week, lab hours per week, and credit:  (Arr-Arr-1)
5. Term(s) to be offered:  □ Fall  x Spring  □ Summer  □ On demand
6. Initial term of offering:  □ Fall  x Spring  □ Summer  □ Year 2008
7. Course description:  Introduction to chemical research areas and techniques. Students will conduct research mini-projects in multiple chemistry research laboratories amongst different subfields of chemistry. May be repeated once if different faculty research labs are chosen. No credit toward major or minor in chemistry.
8. Registration restrictions:
   a. Identify any equivalent courses.  There are no equivalent courses.
   b. Prerequisite(s):  CHM 1310 and 1315 (or CHM 1390 and 1395) with grade of “A; freshmen or sophomore standing; and permission of the department chairperson.
   c.  
   d. Who can waive the prerequisite(s)?
      □ No one  x Chair  □ Instructor  □ Advisor  □ Program Coordinator  □ Other (Please specify)
   e. Co-requisites:  None
   f. Repeat status:  □ Course may not be repeated.
      x Course may be repeated to a maximum of 2 hours.
   g. Degree, college, major(s), level, or class to which registration in the course is restricted:  Freshmen or Sophomores
   h. Degree, college, major(s), level, or class to be excluded from the course, if any:  Juniors or Seniors
9. Special course attributes:  N/A
10. Grading methods:  x Standard letter  □ C/NC  □ Audit  □ ABC/NC
11. Instructional delivery method:  independent study or research

PART II: ASSURANCE OF STUDENT LEARNING

1. List the student learning objectives of this course:
   Students will:
   ● Reinforce and expand basic laboratory skills learned in CHM 1315/1395
   ● Learn proper protocol for working in a scientific research laboratory, including an awareness of safety issues and maintenance of a laboratory research notebook
   ● Apply the scientific method firsthand to chemical research
   ● Gain exposure to and awareness of the different subfields of chemical research
   ● Develop the ability to write effectively about chemical research
   ● Develop the ability to speak effectively about chemical research
a. This is not a general education course.
b. This is not a graduate level course.

2. Identify the assignments/activities the instructor will use to determine how well students attained the learning objectives:

   Students will be assessed based on:
   - 4 written research reports of 1-2 pages each (one on each rotation)
   - A 5 minute oral presentation (on one of the four research rotations)
   - Performance evaluations provided by each of the four rotation faculty supervisors (includes assessment of laboratory skills, protocol, and safety procedures, as well as regular attendance)
   - Laboratory research notebook

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<th>Written Reports</th>
<th>Oral Report</th>
<th>Supervisor Evaluations</th>
<th>Laboratory Notebook</th>
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<td>Reinforce laboratory skills</td>
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<td>Successfully learn laboratory protocol</td>
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<td>Apply the scientific method</td>
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<td>Awareness of variety of chemical subfields</td>
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<td>Develop writing skills</td>
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<td>Develop speaking skills</td>
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3. Explain how the instructor will determine students’ grades for the course:

   The grade will be based on:
   - 10% from the performance evaluation of each of the four faculty supervisors (total 40%)
   - 10% from the evaluation of the faculty coordinator of the course (including attendance, meeting deadlines, format of laboratory notebook)
   - 10% from each of the four written reports (total 40%)
   - 10% from the oral presentation

4. This is not a technology delivered course.

5. The course number for this course is not between 4750 and 4999.

6. This course is designated as writing-active since students will write short reports describing each of their projects and accomplishments, after completion of each research rotation.

PART III: OUTLINE OF THE COURSE

The class will meet for a 1 hour lecture period three times per semester: once at the beginning of the semester for administrative issues, and once each during weeks 8 and 15 for student presentations. Over the remaining 12 weeks, each student will spend 4 - 5 hours per week participating in research in the lab of a faculty member. The student will rotate through four 3-week mini-projects, working in a different faculty member’s research lab in a different subfield of chemistry for each 3 week rotation. A sample course outline is given below:
Week 1: Sign-up for research groups, introduction to laboratory safety and keeping a laboratory notebook, explanation of syllabus, course expectations and procedures.

Weeks 2-4: Research in 1st laboratory rotation (Physical Chemistry).
Week 2: Research in 1st lab rotation, day 1.
Week 3: Research in 1st lab rotation, day 2.
Week 4: Research in 1st lab rotation, day 3.

Weeks 5-7: Research in 2nd laboratory rotation (Organic Chemistry)
Week 5: Research in 2nd lab rotation, day 1; Written report on 1st research rotation due.
Week 6: Research in 2nd lab rotation, day 2.
Week 7: Research in 2nd lab rotation, day 3.

Week 8: Oral reports on research experiences (1st half of students); Written report on 2nd research rotation due.

Weeks 9-11: Research in 3rd laboratory rotation (Inorganic Chemistry).
Week 9: Research in 3rd lab rotation, day 1.
Week 10: Research in 3rd lab rotation, day 2.
Week 11: Research in 3rd lab rotation, day 3.

Weeks 12-14: Research in 4th laboratory rotation (Biological or Analytical Chemistry).
Week 12: Research in 4th lab rotation, day 1; Written report on 3rd research rotation due.
Week 13: Research in 4th lab rotation, day 2.
Week 14: Research in 4th lab rotation, day 3.

Week 15: Oral reports on research experiences (2nd half of students); Written report on 4th research rotation due; Lab notebooks collected.

PART IV: PURPOSE AND NEED

1. **Explain the department’s rationale for developing and proposing the course.**

Many freshman level students taking classes in the Chemistry department have a desire to participate in undergraduate research, but they do not have the necessary laboratory experience to participate in fully independent, semester-long research projects. In addition, many introductory level students have not had much exposure to and are unaware of the five subfields of chemistry (Analytical, Biochemistry, Inorganic, Organic, and Physical), and cannot confidently identify in which particular subfield their interests will lie. By introducing a freshman level research rotation, we hope to expose students who are interested in Chemical research to a variety of different research areas and techniques. This will significantly increase the number of students who gain research experience early in their college careers, and it will also allow these students to sample a range of different research topics before committing themselves to a more advanced and longer term research project.

For non-chemistry majors, the research rotation will provide an understanding and appreciation of Chemistry research that they can carry over to their experiences in other science disciplines (Biology, for example). Students will learn proper laboratory protocols and the proper maintenance of a laboratory notebook so that they will be better prepared for upper division laboratory courses as well as for more extensive undergraduate research in the physical or natural sciences.
Additionally, it has been repeatedly found that Chemistry majors do not enroll in CHM 4400 until late in their undergraduate career. It is hoped that CHM 1440 will act as a stepping stone to encourage earlier enrollment in CHM4400.

a. This course is not a general education course.
b. This course is not a technology delivered course.

2. Justify the level of the course and any course prerequisites, co-requisites, or registration restrictions.

This course is intended for students who have only had one semester of General Chemistry, since these are the students least likely to be aware of the different subfields within chemistry as well as the students least likely to have the preparation necessary to enter CHM4400. We also hope this course will serve Honors students, who are encouraged by the Honors College to begin research as soon as possible. Since most students will take this class concurrently with CHM 1410/1415 or CHM 1490/1495 (General Chemistry II, Honors General Chemistry II), it should have a 1000 level course number.

Since this is a chemistry research course, some fundamental chemical knowledge is required. The prerequisite of CHM 1310/1315 or CHM 1390/1395 (General Chemistry I lecture and lab) will provide this preparation. The grade of “A” in the previous course ensures that the students’ skill and knowledge levels when they enter the research rotation will be high enough that they can succeed in the course. Students who skip CHM 1310/1315 due to Advanced Placement or transfer credit or similar circumstances may enroll in the research rotation course with the consent of the department chairperson.

3. If the course is similar to an existing course or courses, justify its development and offering.

This course is similar to CHM 4400 (Undergraduate Research) in that it is a chemistry research experience for undergraduate students; however, this course will be geared to freshmen who do not have the necessary experience or background to take CHM 4400. This course will give students short experiences in four research groups, instead of the one longer experience in a single research group as received in CHM 4400. The emphasis will be focused more on the student learning proper laboratory skills and a variety of techniques rather than on undertaking a fully independent research project.

4. Impact on Program(s):

a. This course will not count toward the major or minor in chemistry, nor will it affect requirements in any other department.
b. This is not a graduate level course.

PART V: IMPLEMENTATION

1. Faculty member(s) to whom the course may be assigned:

All research active faculty members have offered to act as research supervisors for this course. In addition, a course coordinator will be in charge of the organization, the three lecture sessions, the collection of grades and feedback from faculty mentors, and assignment of the course grade. Likely faculty members for the research rotation experiences are Dr. Blitz, Dr. Klarup, Dr. Lawrence, Dr. McGuire, Dr. R. Peebles, Dr. S. Peebles, Dr. Periyannan, Dr. Sheeran, Dr. Treadwell, Dr. Tremain, and Dr. Wheeler. Likely faculty members for the course coordinator are Dr. Treadwell, Dr. R. Peebles, Dr. S. Peebles, Dr. Klarup.
2. **Additional costs to students:**
   There will be no additional costs to students.

3. **Text and supplementary materials to be used (Include publication dates):** *Writing the Laboratory Notebook* by Kanare (American Chemical Society, 1985)

**PART VI: COMMUNITY COLLEGE TRANSFER**

A community college course will not be judged equivalent to this course.

**PART VII: APPROVALS**

Date approved by the Chemistry Department:  **November 10, 2006**

Date approved by the College of Sciences Curriculum Committee  **April 20, 2007**

Date approved by CAA:  **May 1, 2007**