

**Eastern Illinois University
Revised Course Proposal
CHM 3100, Practicum in Chemistry**

1. Catalog Description

- a. CHM 3100
- b. Practicum in Chemistry
- c. (1- ARR- 1)
- d. Fall
- e. Pract in Chem
- f. Formal Introduction to chemical safety and practical experiences in preparing and handling chemical materials, managing a chemical stockroom and assisting in a chemistry laboratory course.
- g. Prerequisite: CHM 2730 with a grade of C or better. Should be completed prior to student teaching. Enrollment is restricted to students in the Science with Teacher Certification program.
- h. Fall 2004

2. Student Learning Objectives and Evaluation

a. Learning Objectives

Students will:

- ☐ demonstrate a knowledge of current best practices in laboratory safety in an academic setting via a combination of reading and homework assignments and a safety-based research project.
- ☐ demonstrate an ability to prepare reagents and materials for multiple laboratory sections and do so according to written specifications by preparing said materials for CHM 1040G laboratory.
- ☐ demonstrate an ability to prepare, organize and present a chemistry laboratory topic via three pre-laboratory lecture presentations in CHM 1040G laboratory.
- ☐ demonstrate an ability to supervise students in a laboratory setting by serving as an assistant laboratory supervisor in CHM 1040G.

These objectives are intended to satisfy the following Illinois Content-Area Standards* in Science and Chemistry:

- 1. Core Science Standards: 9D, 11C, 13A, and 14A
- 2. Chemistry Standards: 1A, 1B, and 1C.

* Content-Area Standards from the Illinois State Board of Education, 2002. The indicated standards are attached.

b. Evaluation*

- 1. Homework: 40%
- 2. Safety Project: 15%

3. Safety Leadership and Promotion: 15%
4. Pre-Laboratory Lecture Preparation and Presentation: 20%
5. Laboratory Preparation: 10%

* CHM 3500 instructor evaluates items 1 (homework (HW) assignments 1-5) and 2. The cooperating 1040G instructor evaluates items 3 and 4. The Chemistry Stockroom Supervisor evaluates HW assignment 6 and item 5.

3. Course Outline

Week 1: Introduction and Overview, Distribution of Chemical Hygiene Plan (CHP)

Week 2: Personal Protection

Reading: *Safety in Academic Chemistry Laboratories*, pp 1-8; CHP, pp 5-12 and 16-19

Activities/Assignments: Eye Protection Video, HW #1

Week 3: Standard Operating Procedures (SOP) and Handling Gases

Reading: *Safety in Academic Chemistry Laboratories*, pp 9-19, 32-35; CHP, pp 13-14

Activities/Assignments: HW #1 due, HW #2 assigned

Week 4: Material Safety Data Sheets (MSDS)

Reading: *Safety in Academic Chemistry Laboratories*, pp 20-30.

Activities/Assignments: HW #2 due, HW #3 assigned

Week 5: Hazardous Waste

Reading: *Safety in Academic Chemistry Laboratories*, pp 55-58; CHP, pp 15-16

Activities/Assignments: HW #3 due, HW #4 and Safety Project assigned

Week 6: Practical Experiences in Laboratory Management and Supervision: Duties and Responsibilities

Arrange times for: 1) lab preparation and setup experience; 2) assistant lab supervisor in CHM 1040G, World of Chemistry.

Distribute legal case studies concerning laboratory accidents.

Activities/Assignments: HW #6 (solution preparation) and practice pre-laboratory presentation

Week 7: Case Studies: Review and Discussion.

Weeks 8-15

Serve as assistant lab supervisor in assigned section of CHM 1040G lab.

Activities (in addition to lab supervision):

Lab preparation (one experiment) under direction of Chemistry Stockroom Personnel.

Prepare and present three pre-laboratory lectures.

4. Rationale

- a. The proposed course revision is in response to the implementation of the Science with Teacher Certification program in Fall 2002 and in anticipation of a corresponding enrollment increase. Formerly, enrollment was limited to majors and minors in the Chemistry with Teacher Certification program. It is now a required course for all students in the Science with Teacher Certification program.

Much of the safety content and practical experiences associated with the prior version of this course have been retained in this proposal. The key difference is how the course is administered. Previously, the small enrollment permitted class meetings to take place

on an arranged basis. This is no longer possible in light of the anticipated enrollment increase. Hence, a fixed meeting time (1 hour/week) for the first seven weeks replaces formerly arranged meetings. These meetings constitute the laboratory safety segment of the course.

The remainder of the course is identical in structure and format to the previous version. In this part of the course, students acquire laboratory preparation, stockroom management, and laboratory supervision experience working in tandem with Chemistry Stockroom personnel and a faculty member teaching the laboratory component of CHM 1040G. The meeting time in this part of the course is determined by the meeting time of the CHM 1040G lab (2 hours/week) to which the student is assigned.

- b. The chemical knowledge and technical skills needed to prepare lab materials and instruct students in basic laboratory operations are met by successful completion of CHM 2730 with the indicated minimum grade. Note: This prerequisite was implied, though not specified, in the former Chemistry with Teacher Certification program.
- c. The first five weeks of the course are structured so that it overlaps with CHM 3500, Introduction to Research. This commonality with CHM 3500 assures that all Chemistry majors including those in the Science with Teacher Certification program and research students receive the same formal training in laboratory safety. From the sixth week on, the course is unique and specifically designed for students in the Science with Teacher Certification program.
- d. CHM 3100 is required of all students majoring in the Secondary Science with Teacher Certification program.

5. Implementation

- a. Multiple instructors will be involved each time the course is offered. Lab Safety: Dr. Klarup; Stockroom Management and Laboratory Preparation: Mr. Ken Osborn; Pre-Laboratory Preparation and Presentation and Laboratory Supervision: Faculty teaching CHM 1040G.
- b. No additional costs.
- c. American Chemical Society Committee on Chemical Safety. *Safety in Academic Chemistry Laboratories*, 6th ed. American Chemical Society. Washington, 1995. Department of Chemistry Eastern Illinois University, *Chemical Hygiene Plan*, 2002.

6. Community College Transfer

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

7. Date approved by the department or school: 10/22/03

8. Date approved by the college curriculum committee: 11/21/03

9. Date approved by CAA: 12/11/03

ATTACHMENT

STANDARD 9 - Practices of Science

The competent science teacher understands and applies accepted practices and implications of science in contemporary and historical contexts.

Knowledge Indicators: *The competent science teacher*

- 9A. Understands that the nature of science is a human endeavor characterized as tentative, public, replicable, probabilistic, historic, unique, holistic and empirical.
- 9B. Understands the definitions of hypotheses, predictions, laws, theories, and principles and the historic and contemporary development and testing of them.
- 9C. Understands research and reports examples of hypotheses, predictions, laws, theories, and principles, and valid and biased thinking.
- 9D. Understands the basis for safety practices and regulations in the study of science.

Performance Indicators: *The competent science teacher*

- 9E. Will research and report examples of creative and critical thinking skills in scientific research and technological innovation.
- 9F. Will research and report examples of predictions, hypotheses, and theories in both valid and biased scientific thinking.
- 9G. Will research and report examples of the development of science through time and the impact of societal values on the nature of science.
- 9H. Will document and practice safety rules and show evidence of their necessity in the investigation of science.
- 9I. Will demonstrate the ability to use instruments and be able to explain functions of appropriate safety equipment used to assure and implement safe practices.

STANDARD 11 - Unifying Concepts

The competent science teacher understands the major unifying concepts of all sciences (systems, order, and organization; evidence, models, and explanation; constancy, change, and measurement; evolution and equilibrium; form and function), and how these concepts relate to other disciplines, particularly mathematics and the social sciences.

Knowledge Indicators - *The competent science teacher:*

- 11A. understands connections within and among the traditional scientific disciplines.

- 11B. understands fundamental comparability of the processes shared within and among the traditional scientific disciplines.
- 11C. understands fundamental mathematical language, knowledge and skills.
- 11D. understands fundamental relationships among the sciences and the social sciences.

Performance Indicators - *The competent science teacher:*

- 11E. identifies and describes the application of the unifying concepts in real-life situations.
- 11F. utilizes the unifying concepts from science, as well as concepts from mathematics, the social sciences, and other disciplines in his or her teaching.
- 11G. expresses phenomenological relationships in the language of mathematics, solving simple algebraic equations, using scientific notation, constructing and interpreting graphs and using probabilities.

STANDARD 12 – Curriculum in Science

The competent science teacher understands how to develop learning outcomes for science instruction that incorporate State and national frameworks for teaching science and how to select appropriate curriculum materials to meet the standards-based outcomes.

Knowledge Indicators - *The competent science teacher:*

- 12A. understands the local, State and national goals and standards for science education.
- 12B. understands the relationship of science concepts to the developmental level of students in classrooms.
- 12C. understands how to articulate science instruction across units and from year to year.

Performance Indicators - *The competent science teacher:*

- 12D. identifies how an instructional design relates to local, State, and national goals and standards for science.
- 12E. identifies appropriate curricular materials from a variety of sources and selects those that meet the developmentally appropriate, standards-led instructional outcomes.
- 12F. demonstrates the ability to articulate learning across and among units of instruction, courses in science, and other disciplines.

Science – A Common Core of Standards [27.140] 2nd Edition 2002 151

STANDARD 13 - Planning for Instruction in Science

The competent science teacher understands how to plan learning experiences that utilize an appropriate variety of instructional methods and strategies that allow students to develop significant concepts in science and the ability to engage in scientific reasoning.

Knowledge Indicators - *The competent science teacher:*

- 13A. understands how to use materials from the students' environment to help them use inquiry strategies to build concepts.
- 13B. understands the appropriate use of various strategies of direct instruction, concept development, inquiry and problem solving that lead to knowledge and skills for scientific reasoning.
- 13C. understands how concepts are developed in students' minds and how to address misconceptions that students have developed from prior experiences.

Performance Indicators - *The competent science teacher:*

- 13D. plans instruction that allows students to develop understanding of significant concepts and skills in science through hands-on experiences with real materials.
- 13E. plans instruction that incorporates a variety of methods and strategies for learning, including demonstrations, the laboratory, and out-of-class resources.
- 13F. plans instruction utilizing instructional technology, instructional materials, and scientific equipment.
- 13G. plans instructional activities that create opportunities for students to test, modify, and sometimes abandon previous ideas about science.

STANDARD 14 - *Environment for Learning*

The competent science teacher can design and manage safe and supportive learning environments in which all students can engage in scientific inquiry and concept development.

Knowledge Indicators - *The competent science teacher:*

- 14A. understands liability and negligence, especially as applied to science teaching.
- 14B. understands procedures for safe and ethical use and care of animals for science instruction.

Performance Indicators - *The competent science teacher:*

- 14C. designs and assesses learning environments to utilize safe practices to prevent potential problems of liability and negligence regarding the inventory, storage, and disposal of chemicals, resources, and equipment.
 - 14D. develops a set of criteria to measure and assesses the optimum learning environment that promotes scientific inquiry and learning.
 - 14E. develops procedures to adapt learning environments to meet students' special needs.
- Chemistry [27.160] 2nd Edition 2002 159

**Chemistry
[27.160]**

In addition to the standards for all science teachers that are set forth in Section 27.140 of this Part, those who specialize in the teaching of chemistry shall be required to meet the standards described in this Section.

STANDARD 1

The competent chemistry teacher possesses basic scientific and mathematical skills, utilizes safe laboratory practices, and is aware of issues of public concern.

Knowledge Indicators - *The competent chemistry teacher:*

- 1A. understands the appropriate mathematical skills to solve problems; is aware of methods used in collecting, analyzing, and reporting data, including basic statistical and computational concepts, and the use of technology in the learning process.
- 1B. understands the appropriate experimental procedures and common scientific equipment for measurement and determination of chemical reactions and properties.
- 1C. understands chemical hygiene plans, safe and proper use of equipment, and materials commonly used in chemistry laboratories, including proper waste disposal and procedures for preventing and dealing with accidents and injuries in the laboratory.

- 1D. understands the role of chemistry in daily life, including ways in which basic research and the development of new technology affect society.

Performance Indicators - *The competent chemistry teacher:*

- 1E. solves simple algebraic operations, uses scientific notation, plots and interprets graphs.
1F. uses computer programs to organize data and indicate relationships.
1G. selects appropriate instrumentation and methods of chemical analysis.
1H. implements an appropriate chemical hygiene plan as part of the process of setting up and running a safe and effective chemistry laboratory course.
1I. relates chemistry and technology to issues of societal importance.

STANDARD 2

The competent chemistry teacher understands and applies the concepts of the nature of matter at the atomic level.

Knowledge Indicators - *The competent chemistry teacher:*

- 2A. understands the chemical constitution of matter as elements, compounds, and mixtures and the distinction between physical and chemical changes.
2B. understands the development and central concepts of atomic theory and atomic structure, including the quantum mechanical model.
2C. understands the names and electronic structure of common elements and their ions.
2D. understands the periodic nature of the elements and the relationship between their electron configuration and the periodic table.