

Course Proposals for Chemistry Program Revisions

<b>LSC Use Only</b> No:	LSC Action-Date:	<b>UWUCC USE Only</b> No.	UWUCC Action-Date:
		Senate Action Date:	App 4/29/03
		02-609	

App 3/25/03

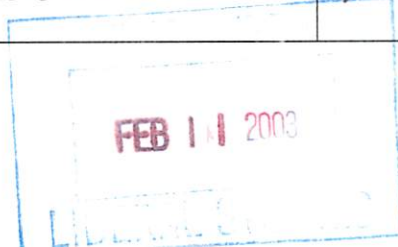
Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

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Proposing Department/Unit: <b>Chemistry</b>	Phone: <b>7-2362</b>

Check all appropriate lines and complete information as requested. Use a separate cover sheet for each course proposal and for each program proposal.

<b>1. Course Proposals (check all that apply)</b>	
<input checked="" type="checkbox"/> New Course	<input type="checkbox"/> Course Prefix Change
<input type="checkbox"/> Course Revision	<input type="checkbox"/> Course Number and/or Title Change
<input type="checkbox"/> Course Deletion	<input type="checkbox"/> Catalog Description Change
CHEM 214 – Intermediate Inorganic Chemistry	
<u>Current</u> Course prefix, number and full title	<u>Proposed</u> course prefix, number and full title, if changing
<b>2. Additional Course Designations: check if appropriate</b>	
<input type="checkbox"/> This course is also proposed as a Liberal Studies Course.	<input type="checkbox"/> Other: (e.g., Women's Studies, Pan-African)
<input type="checkbox"/> This course is also proposed as an Honors College Course.	
<b>3. Program Proposals</b>	
<input type="checkbox"/> New Degree Program	<input type="checkbox"/> Program Title Change
<input type="checkbox"/> New Minor Program	<input type="checkbox"/> New Track
<input type="checkbox"/> Catalog Description Change	<input type="checkbox"/> Program Revision
<input type="checkbox"/> Other	
<u>Current</u> program name	<u>Proposed</u> program name, if changing
<b>4. Approvals</b>	
	Date
Dept Curriculum Committee Chair	Rachel F. See 2/3/03
Department Chair	Dennis Van Tassent Ramsey 2/5/03
Coll. Curriculum Committee Chair	2/10/03
College Dean	2/11/03
Director of Liberal Studies *	
Director of Honors College *	
Provost *	
Additional signatures as appropriate: (include title)	
UWUCC Co-Chairs	Gail S. Schmitt 3/25/03

\* where applicable



## Course Proposals for Chemistry Program Revisions

### Part II. 1. New syllabus of record.

#### I. Catalog Description

Course Title: Intermediate Inorganic Chemistry (1c-3l-2sh)

Prefix: CHEM

Number: 214

Hours: 1c-3l-2sh

Prerequisites: CHEM 112 or 114

Description: The course will present the characteristic reactions and compounds of elements from across the periodic table. For the main-group elements, both discrete molecular compounds and non-molecular materials will be discussed. For the alkali, transition and inner-transition metals, the focus will be on non-molecular species such as ionic compounds, ceramics, superconductors and other inorganic-based materials. The solid-state structure of inorganic-based materials will also be presented. Laboratory activities will be used to reinforce concepts presented in lecture, and to stimulate interest through discovery-based exercises

#### II. Objectives: Upon successful completion of this course, the student will:

- 1) know trends inherent in the arrangement of the elements on the periodic table as a basis for understanding the descriptive chemistry of the elements
- 2) know the characteristic properties and reactions of the main-group elements.
- 3) know the characteristic compounds of the main-group elements.
- 4) be able to identify the basic structural motifs in the solid state.
- 5) understand the essential features of electron flow in inorganic materials.
- 6) understand the essential relationships between composition and properties in inorganic materials.
- 7) be able to apply principles learned in lecture to laboratory experiments, so that they can qualitatively and quantitatively analyze empirical data and explain its significance.

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### III. Detailed Course Outline: (Midterm exam given during lab period)

- 1) Periodic Trends (1 hour)
- 2) Compounds and reactions involving the elements of: (6 hours)
  - a) Groups 1 and 2: The alkali and alkaline earth metals
  - b) Group 13: Boron, aluminum, and beyond
  - c) Group 14: Carbon, silicon, tin, and lead
  - d) Group 15: Nitrogen, phosphorus, arsenic, and bismuth
  - e) Group 16: Oxygen, sulfur, selenium, tellurium
  - f) Group 17: The halogens
  - g) Group 18: The noble gases
  - h) The Descriptive Chemistry of the Transition Metals
- 3) Ionic Bonding (1 hour)
- 4) Solid-State Structures (2 hours)
- 5) Inorganic-based Materials, including: (4 hours)
  - a) ceramics
  - b) semi-conductors
  - c) superconductors
  - d) inorganic polymers
  - e) metals and alloys

### IV. Evaluation Methods:

Midterm Exam	100pts (20%)
Quizzes/weekly assignments	100pts (20%)
Laboratory Exercises	200 pts (40%)
Final Exam	100pts (20%)

The midterm and final exams will include a section of multiple choice and/or short-answer questions. They will also contain a number of word problem/short essay questions, these questions will account for at least 50% of the value of the exam. Each exam will be cumulative over half of the semester. The midterm exam will be administered during one of the laboratory sessions. Quizzes and weekly assignments will be based on assigned problems and may include small group work. Laboratory exercises include laboratory reports with sections for experimental objectives, data and results, and questions and conclusions.

### V. Example Grading Scale

A:  $\geq 90\%$  B: 80-89% C: 70-79% D: 60-69% F:  $< 60\%$

### VI. Attendance Policy:

The attendance policy for this course will be consistent with the university undergraduate attendance policy as described in the current catalogue.

### VII. Required Textbook(s), Supplemental Books and Readings:

*Descriptive Inorganic Chemistry, Third Edition*, Geoff Rayner-Canham and Tina Overton, W. H. Freeman, New York (2002)

## Course Proposals for Chemistry Program Revisions

### VIII. Special Resource Requirements:

- 1) Safety goggles
- 2) Laboratory notebook

### IX. Bibliography:

- 1) *Descriptive Inorganic Chemistry, Third Edition*, Geoff Rayner-Canham and Tina Overton, W. H. Freeman: New York (2002)
- 2) *Descriptive Inorganic, Coordination and Solid State Chemistry*, G.E. Rodgers, 2<sup>nd</sup> ed., Brooks/Cole-Thomson Learning: Toronto, Canada (2002).
- 3) *Teaching General Chemistry: A Materials Science Companion*, A.B. Ellis, M.J. Geselbracht, B.J. Johnson, G.C. Lisensky, and W.R. Robinson, ACS Books (1993).
- 4) *Chemistry of the Elements*, N.N. Greenwood and A. Earnshaw, 2<sup>nd</sup> ed., Butterworth-Heinemann, (1997).
- 5) *The Elements*, John Emsley, 3<sup>rd</sup> ed., Oxford University Press: New York (1998).
- 6) *The Chemical Bond in Inorganic Chemistry: The Bond Valence Model*, I. David Brown, IUCr Monographs (2002).
- 7) *Descriptive Inorganic Chemistry*, James E. House and Kathleen A. House, Harcourt Academic Press: San Diego, (2001).

### Other information:

#### Laboratory Schedule

- 1) Introduction; Safety and Check-In
- 2) Periodic Properties
- 3) Group 1 and Group 2 Ions and Water Hardness
- 4) The Properties of Aluminum and the Synthesis of Alum
- 5) Oxidation Stability of Tin and Lead
- 6) The Chemistry of Group 16 Elements
- 7) Midterm Examination
- 8) The Chemistry of the Halogens
- 9) Properties of Transition Metals
- 10) Solid State Structures and Properties
- 11) X-Ray Analysis of a Solid
- 12) Hydrogen Insertion into WC<sub>3</sub>
- 13) Inorganic Polymers: The Sol-Gel Preparation of Silica Gel Sensors
- 14) A Shape Memory Alloy, NiTi

## Course Analysis Questionnaire

### Section A: Details of the Course

A1 How does this course fit into the programs of the department? For what students is the course designed? (majors, students in other majors, liberal studies). Explain why this content cannot be incorporated into an existing course.

Intended for chemistry and chemistry education majors. This course is intended to replace and extend the material presented in the current CHEM 114/116. It is not possible to incorporate all the material in a typical first-year chemistry sequence and the descriptive chemistry of the elements without severely compromising other topics in the course that provide important background for subsequent courses in the major.

A2 Does this course require changes in the content of existing courses or requirements for a program? If catalog descriptions of other courses or department programs must be changed as a result of the adoption of this course, please submit as separate proposals all other changes in courses and/or program requirements.

Yes, CHEM 113, 114 and 411 are also being revised (all are included in this proposal package).

A3 Has this course ever been offered at IUP on a trial basis (e.g. as a special topic) If so, explain the details of the offering (semester/year and number of students).

No

A4 Is this course to be a dual-level course? If so, please note that the graduate approval occurs after the undergraduate.

No

A5 If this course may be taken for variable credit, what criteria will be used to relate the credits to the learning experience of each student? Who will make this determination and by what procedures?

No variable credit

A6 Do other higher education institutions currently offer this course? If so, please list examples (institution, course title).

West Chester Univ., CHE 409, Descriptive Inorganic Chemistry  
Clarion Univ., CHEM 271, Introductory Inorganic Chemistry  
Millersville Univ., CHEM 251, Inorganic Chemistry I  
Eastern Illinois Univ., 2310 CHM, Descriptive Inorganic Chemistry  
Hamilton College, CHEM 265S, Inorganic Chemistry and Materials  
University of Victoria, CHEM 222, Introduction to Inorganic Chemistry  
Oberlin College, CHEM 213, Inorganic Chemistry  
University of Tennessee at Knoxville, CHEM 230, Inorganic Chemistry

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A7 Is the content, or are the skills, of the proposed course recommended or required by a professional society, accrediting authority, law or other external agency? If so, please provide documentation.

Yes

The American Chemical Society's Committee for Professional Training (ACS-CPT) describes in its guidelines for accreditation that "optimum learning occurs where problem solving and laboratory experience reinforce the study of essential content." The ACS-CPT also recommends that "wherever possible, core courses should include examples of materials chemistry." CHEM 214 is a core course in the revised curriculum that provides students with examples of materials chemistry and inorganic polymers while presenting a systematic descriptive chemistry of the elements. The recommendations in Inorganic Chemistry for a second-level core course in Inorganic Chemistry build upon "the introductory courses that cover elementary principles of chemical bonding and structure, thermodynamics, kinetics, and descriptive chemistry of the elements." The descriptive chemistry of the elements requires practical hands-on experiences to appreciate the "practical aesthetic, and humanistic aspects of chemistry."

### **Section B: Interdisciplinary Implications**

B1 Will this course be taught by instructors from more than one department? If so, explain the teaching plan, its rationale, and how the team will adhere to the syllabus of record.

No

B2 What is the relationship between the content of this course and the content of courses offered by other departments? Summarize your discussions (with other departments) concerning the proposed changes and indicate how any conflicts have been resolved. Please attach relevant memoranda from these departments that clarify their attitudes toward the proposed change(s).

No significant overlap with courses from any other department.

B3 Will this course be cross-listed with other departments? If so, please summarize the department representatives' discussions concerning the course and indicate how consistency will be maintained across departments.

No

### **Section C: Implementation**

C1 Are faculty resources adequate? If you are not requesting or have not been authorized to hire additional faculty, demonstrate how this course will fit into the schedule(s) of current faculty. What will be taught less frequently or in fewer sections to make this possible? Please specify how preparation and equated workload will be assigned for this course.

This course will count as one preparation and four hours of equated workload. Present complement of faculty in the Chemistry Department is adequate to assume this additional workload.

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C2 What other resources will be needed to teach this course and how adequate are the current resources? If not adequate, what plans exist for achieving adequacy? Reply in terms of the following:

Present departmental resources are adequate to teach this course.

C3 Are any of the resources for this course funded by a grant? If so, what provisions have been made to continue support for this course once the grant has expired? (Attach letters of support from Dean, Provost, etc.)

No

C4 How frequently do you expect this course to be offered? Is this course particularly designed for or restricted to certain seasonal semesters?

Once per year, in the spring semester.

C5 How many sections of this course do you anticipate offering in any single semester?

One

C6 How many students do you plan to accommodate in a section of this course? What is the justification for this planned number of students?

The maximum number of students is that which can be safely accommodated in a typically available laboratory classroom; at present this number is 24. This should be large enough to include all the sophomore chemistry and chemistry education majors in one laboratory section.

C7 Does any professional society recommend enrollment limits or parameters for a course of this nature? If they do, please quote from the appropriate documents.

No

C8 If this course is a distance education course, see the Implementation of Distance Education Agreement and the Undergraduate Distance Education Review Form in Appendix D and respond to the questions listed.

Not a distance education course.