LSC Use Only Proposal No:	UWUCC Use Only Proposal No 12-24i
LSC Action-Date:	UWUCC Action-Date: App-10/16/12 Senate Action Date: App-11/6/12

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) **Wendy Elcesser**	Email Address **endyw@iup.edu**
Proposing Department/Unit **Chemistry**	Phone 72362

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

1. Course Proposals (check all that apply)

_____ New Course _____ Course Prefix Change _____ Course Deletion

__X__ Course Revision _____ Course Number and/or Title Change __X__ Catalog Description Change

Current course prefix, number and full title: CHEM 411 Advanced Inorganic Chemistry

Proposed course prefix, number and full title, if changing: _____ I

2. Liberal Studies Course Designations, as appropriate

_____ This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

_____ Learning Skills _____ Knowledge Area _____ Global and Multicultural Awareness _____ Writing Intensive (include W cover sheet)

_____ Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)

_____ Global Citizenship _____ Information Literacy _____ Oral Communication

_____ Quantitative Reasoning _____ Scientific Literacy _____ Technological Literacy

3. Other Designations, as appropriate

_____ Honors College Course _____ Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

_____ Catalog Description Change _____ Program Revision _____ Program Title Change _____ New Track

_____ New Degree Program _____ New Minor Program _____ Liberal Studies Requirement Changes _____ Other

Current program name: _____

Proposed program name, if changing: _____

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)		4/11/12
Department Chairperson(s)		4/11/12
College Curriculum Committee Chair		4/20/12
College Dean		4/20/12
Director of Liberal Studies (as needed)		
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	Gail S Sechrist	10/16/12

Received

APR 20 2012

Liberal Studies

Part II. Description of Curricular Change

1. New Syllabus of Record

I. Catalog Description

CHEM 411 Advanced Inorganic Chemistry (2c-3l-3cr)

Prerequisites: CHEM 214, CHEM 342

Discussion of advanced theories of atomic structure, chemical bonding, acids and bases, coordination compounds, and selected topics. In the laboratory portion of the course, techniques used in the synthesis and characterization of inorganic compounds are explored.

II. **Course Outcomes:** Upon successful completion of this course, the student will be able to:

1. Assign point groups and use character tables
2. Explain some of the properties of molecules that are symmetry-driven using Group Theory
3. Construct molecular orbital diagrams for diatomic and polyatomic molecules/ions using symmetry
4. Describe the reactions of coordination complexes including the implications of ligand substitution kinetics and the classification of reaction types (associative and dissociative) and relate them to the mechanism of these reactions.
5. Evaluate the thermodynamic considerations of the chelate effect.
6. Plan a synthetic route to a particular square planar complex using the trans-directing series of ligands
7. Predict the stereochemical outcome of ligand substitution in octahedral complexes.
8. Correlate the modification of ligands in reactions of coordination complexes to the reactions in organotransition metal chemistry.
9. Describe the chemistry of metal carbonyls, metal-olefin complexes and the metallocenes
10. Use the principles of oxidative addition and reductive elimination to describe examples of homogeneous and heterogeneous catalysts
11. Describe cluster compounds and their importance.
12. Prepare of a variety of inorganic compounds.
13. Characterize a variety of inorganic compounds by spectroscopic methods.

III. **Detailed Course Outline**: (allows 2 hours for exams)

A. Review of Atomic Structure. (2 hours)
Spectra and orbitals, ionization energy, electron affinity, shielding and effective nuclear charge.

B. Covalent Molecular Substances (6 hours)
Review of Lewis structures and Valence Shell Electron Pair Repulsion Theory, Deviations from Ideal Geometries, Valence Bond Theory and Hybridization, Symmetry and Point Groups (including properties that are symmetry-related), Character tables and reducible and irreducible representations, multi-centered MO, electron-deficient molecules, π –donor and acceptor ligands).

C. Exam #1 (1 hour)

D. Transition Elements and Coordination Chemistry. (6 hours)
Ligand field and molecular orbital theories, Jahn-Teller effects, magnetic properties, electronic spectroscopy (term symbols and spectrochemical series), thermodynamic aspects (formation constants, hydration enthalpies, chelate effect), kinetic aspects (ligand substitution, electron transfer, fluxional behavior), lanthanides and actinides.

E. Exam #2 (1 hour)

F. Organometallic Chemistry. (6 hours)
Metal carbonyls, hydrocarbon and carbocyclic ligands, 18-electron rule (saturation and unsaturation), synthesis and properties, patterns of reactivity (substitution, oxidative-addition and reductive-elimination, insertion and de-insertion, nucleophilic attack on ligands, isomerization, stereochemical nonrigidity).

G. Special Topics. (6 hours)
Catalysis and important industrial processes, condensed materials containing chain, ring, sheet, cage, and network structures, supramolecular structures, nanoscale structures and effects

H. Final Examination (during Final Examination Period) (2 hours)

IV. Evaluation Methods.

3 exams including final @ 100 pts	300 pts. (54.5%)
Selected Assignments (problem sets)	100 pts. (18.2%)
Laboratory Reports	100 pts. (18.2%)
Laboratory Poster	50 pts. (9.1%)
Total points	550 pts. (100.0%)

V. Example Grading Scale: The percentages of the total points to guarantee each letter grade are as follows:

$x \geq 90\%$	A
$90 > x \geq 80\%$	B
$80 > x \geq 70\%$	C
$70 > x \geq 60\%$	D
$60 > x$	F

VI. Undergraduate Course Attendance Policy: Attendance is expected for all classes. Individual faculty will include in their syllabus an attendance policy consistent with the Undergraduate Course Attendance Policy in the IUP Undergraduate Catalog.

VII. Required Textbooks, Supplemental Books and Readings:

Girolami, G. S.; Rauchfuss, T. B.; Angelici, R. J. Synthesis and Technique in Inorganic Chemistry, University Science Books: Sausalito, CA, 1999.

D.F. Shriver and P. W. Atkins (et al.)Inorganic Chemistry. 5th Edition, W.H. Freeman and Company: New York, 2009.

VIII. Special Resource Requirements:

Laboratory Notebook.
Safety Goggles.

IX. Bibliography

1. The ACS Style Guide, 3rd Edition ; A.M. Coghill and L.R. Garson, Editors.; American Chemical Society: Washington, DC, 2006.
2. Angelici, R. J. Synthesis and Technique in Inorganic Chemistry (1st Ed), Saunders: Philadelphia, 1977.
3. Brisdon, A. K. Inorganic Spectroscopic Methods, Oxford Science Publications (Oxford Chemistry Primeres), 1998.
4. Cotton, F.A.; Wilkinson, G.; Murillo, C.A.;Bochmann, M. Advanced Inorganic Chemistry, 6th Edition, Wiley: New York, 1999.
5. Cotton, F.A. Chemical Applications of Group Theory, 3rd Ed. John Wiley & Sons: New York, 1990.
6. Douglas, B.; McDaniel, D.; Alexander,J. Concepts and Models of Inorganic Chemistry, 3rd Ed. John Wiley & Sons: New York, 1994.
7. Drago, R. S. Physical Methods for Chemists, Second Edition, Saunders: Philadelphia, 1992.
8. Ebsworth, E. A. V.; Rankin, D. W. H.; Cradock, S. Structural Methods in Inorganic Chemistry Second Edition CRC Press: Boca Raton, FL: 1991.
9. Errington, R. J., Advanced Practical Inorganic and Metalorganic Chemistry, Blackie A&P, London, 1997.
10. Gillespie, R.J.; Popelier, P.L.A. Chemical Bonding and Molecular Geometry, Oxford University Press: New York, 2001.
11. Housecroft, C.E.; Sharpe, A.G. Inorganic Chemistry, 3rd Ed., Prentice Hall: Upper Saddle River, NJ, 2008.
12. Huheey, J.E.; Keiter, E.A; Keiter, R.L. Inorganic Chemistry Principles of Structure and Reactivity, 4th ed., Prentice Hall: New York , 1997.
13. Jolly, W.L. Modern Inorganic Chemistry, 2nd Ed. McGraw-Hill: New York, 1991.
14. Jolly, W.L. The Synthesis and Characterization of Inorganic Compounds, McGraw-Hill: New York, 1991.
15. Miessler, G.L.; Tarr, D.A. Inorganic Chemistry, 4th. Ed.; Prentice Hall: Upper Saddle River, NJ, 2010.
16. Pavia, D. L.; Lampman, G. M.; Kriz, G. S.; Vyvyan, J.A. Introduction to Spectroscopy. A Guide for Students of Organic Chemistry, 4th. Ed., Brooks Cole: Philadelphia, 2008.
17. Silverstein, R. M.; Bassler, G. C.; Morrill, T. C.; Spectrophotometric Identification of Organic Compounds, Fifth Edition, Wiley: New York, 1991.
18. Szafran, Z.; Pike, P.M.; Singh, S. Microscale Inorganic Laboratory, John Wiley and Sons: New York, 1990.

19. Vincent, A. Molecular Symmetry and Group Theory, 2nd Ed. John Wiley & Sons: New York, 2001.
20. Woolins, J. D. Inorganic Experiments, 3rd Edition, Wiley/VCH Publishers: New York, 2010.
21. Zubrick, J. The Organic Chem Lab Survival Manual, 8th Ed., John Wiley & Sons: Hoboken, NJ, 2010.

Suggested Laboratory Outline

1. Introduction, Safety, and Check-In
2. Ion Exchange Separation of Chromium Complexes
3. Ion-Exchange Chromatography: Characterization of Complexes
4. The Borane-Amine Adduct BH_3:$NH_2C(CH_3)_3$, Part I
5. The Borane-Amine Adduct BH_3:$NH_2C(CH_3)_3$, Part II
6. The Layered Solids $VO(PO_4)(H_2O)_2$ and $VO(HPO_4)(H_2O)_{0.5}$
7. Preparation and Aquation of $Co(NH_3)_5Cl^{2+}$
8. Bioinorganic Coordination Chemistry: Copper (II)Tetraphenylporyphyrinate
9. The Microscale Synthesis of $Ir(Cl)(CO)(PPh_3)_2$
10. Preparation of Ferrocene
11. Acetylation of Ferrocene
12. The Molecular Sieve Zeolite-X.
13. Wrap-Up and Check-Out
14. Final Poster Session.

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 majors. This course is intended as a revision to the current CHEM 410 and 411. The 2008 ACS (American Chemical Society) Guidelines describe foundation and in-depth course work as the two categories of experiences (beyond the introductory experience) that approved programs provide their students for an ACS-certified B.S. Chemistry degree.

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 – the total number of credits in inorganic chemistry would remain at six in the Chemistry B.S. program, but CHEM 214 would increase from 2 to 3 credits, and the combination of CHEM 410/411 (Advanced Inorganic Lab/Advanced Inorganic Chemistry) would be replaced by this revised 3-credit CHEM 411.

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).

Virtually all undergraduate departments of chemistry offer an upper-level course in inorganic chemistry. Examples include:
West Chester Univ., CHE 411 Advanced Inorganic Chemistry and CRL 411 Inorganic Syntheses
Clarion Univ., CHEM 456 Advanced Inorganic Chemistry and CHEM 461 Adv. Inorg/Org. Lab
Millersville Univ., CHEM 452, Inorganic Chemistry II
Eastern Illinois Univ., CHM 4900, Inorganic Chemistry II
Hamilton College, CHEM 423, Advanced Inorganic Chemistry
University of Victoria, CHEM 421, Advanced Inorganic Chemistry

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 what it calls "In-Depth Course Work" in the following way: "the certified major must also include at a minimum the equivalent of four one-semester courses or six one-quarter courses (corresponding to at least 12 semester or 18 quarter credit hours) of in-depth course work. An in-depth course builds on prerequisite foundation course work. The goals of in-depth course work are both to integrate topics introduced in the foundation courses and to investigate these topics more thoroughly." CHEM 411 is designed to be one of the In-Depth courses in the Chemistry B.S. degree program. Additionally, the CPT requires a minimum of 400 hours of laboratory work beyond General Chemistry for their certified degree. The laboratory component of the revised CHEM 411 course would provide 42 (3 per week x 14 weeks) of these hours toward the Chemistry B.S. degree.

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.

Present complement of faculty in the Chemistry Department is adequate.

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 fall 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?

12– this should large enough to include all the senior chemistry 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.

2. **Summary of proposed Revisions**

Since CHEM 214 (Intermediate Inorganic Chemistry) was expanded from two credits to three credits, CHEM 411 (Advanced Inorganic Chemistry) is combined with CHEM 410 (Advanced Inorganic Chemistry Laboratory) to become the new in-depth course in the subdiscipline of Inorganic Chemistry.

3. **Justification/Rationale for Change**

The American Chemical Society's Committee for Professional Training (ACS-CPT) calls for students to take foundation course work in all five major areas of chemistry, and in-depth course in four of the five areas (Analytical, Biochemistry, Inorganic, Organic, and Physical). Whereas the revised CHEM 214 provides students with the Foundation Course in Inorganic Chemistry, the revised CHEM 411 is an in-depth course that builds on prerequisite foundation course work. The additional credit to CHEM 214 (for the required total of 3 credits) was redistributed from CHEM 411/410 (which are now also 3 credits instead of the previous 4 when combined). Additionally, the CPT requires a minimum of 400 hours of laboratory work beyond General Chemistry for their certified degree. The laboratory component of the revised CHEM 411 course would provide 42 (3 per week x 14 weeks) of these hours toward the Chemistry B.S. degree.

1. **Old Syllabi of Record** for CHEM 411 and CHEM 410 (attached)

LSC Use Only
Number: _____
Action: _____
Date: _____

UWUCC Use Only
Number: _____
Action: _____
Date: _____

CURRICULUM PROPOSAL COVER SHEET
University–Wide Undergraduate Curriculum Committee

I. Title/Author of Change

Course/Program Title: CH 410-Advanced Inorganic Lab
Suggested 20 Character Course Title: Adv Inorganic Lab
Department: Chemistry
Contact Person: Dr. John Woolcock

II. If a course, is it being Proposed for:

X Course Revision/Approval Only
_____ Course Revision/Approval and Liberal Studies Approval
_____ Liberal Studies Approval Only (course previously has been approved by the University Senate)

III. Approvals

John C Woolcock
Department Curriculum Committee

Department Chairperson

Akaniasty
College Curriculum Committee

College Dean *

Director of Liberal Studies (where applicable)

Provost (where applicable)

*College Dean must consult with Provost before approving curriculum changes. Approval by College Dean indicates that the proposed change is consistent with long range planning documents, that all requests for resources made as part of the proposal can be met, and that the proposal has the support of the university administration.

IV. Timetable

Date Submitted to LSC: _____
to UWUCC: 9/91

Semester to be implemented: Fall 1992

Date to be published in Catalog: Fall 1992

COURSE SYLLABUS

I. Catalog Description

CH 410 - Advanced Inorganic Chemistry Laboratory

1 credit
0 lecture hours
3 lab hours
(0c-31-1sh)

Prerequisite: CH 322

A laboratory course in which the techniques used in the synthesis and characterization of inorganic compounds will be explored. Emphasis will be placed on the preparation of a wide variety of inorganic compounds and the methods by which they are identified and characterized.

II. Course Objectives

A. Introduce the student to the methods used in the preparation of a wide variety of inorganic compounds.

B. Introduce the student to techniques used in the handling of microscale quantities (0.05-0.15 grams) of inorganic compounds.

C. Examine the use of spectroscopic techniques in the characterization of inorganic compounds.

III. Course Outline

A. Chemistry of the Main Groups Elements (5 weeks)
   1. Inorganic Polymers: Triethyborate and Silicone Polymers
   2. Variable Oxidation States of Tin and Lead: Preparation of Tin(II) Iodide, Tin(IV) Iodide, Ammonium Hexachloroplumbate(IV) or Ammonium Hexachloroplumbate(IV) or Ammonium Hexachlorostannante(IV)
   3. Oxyacids and their Derivatives: Synthesis and NMR Spectroscopy of Phosphorus Acid and its Esters
   4. Use of Transmetallation in Inorganic Synthesis: Preparation of Organo-tin Compounds or Trichlorodiphenyl Antimony

B. Coordination Chemistry (4 weeks)
   1. Synthesis and Infrared Analysis of the Dimethylsulfoxide Complexes of Copper, Ruthenium and Palladium
   2. Compounds with Metal-Metal Bonds: Preparation and Determination of the Magnetic Moment of Copper and Rhodium Acetates
   3. Determination of Δ_o for Cr(III) Complexes

C. Organometallic Chemistry (4 weeks)
   1. NMR Investigation of Molecular Fluxionality: Synthesis of Allyl Palladium Complexes
   2. Chromatographic Analysis of the Acylation of Ferrocene
   3. Synthesis of Metal Carbonyls

IV. Evaluation Method

The final grade for the course will be determined as follows:
80%-laboratory reports
20%-laboratory notebook

Laboratory reports will be graded using the following scheme based on the format used for publications in the inorganic literature:
10%-Abstract or Introduction
10%-Experimental Methods
35%-Summary of Results
40%-Discussion of Results
5%-References or Bibliography

The laboratory notebook will be examined several times during the semester and will be graded on the following:
10%-Acceptable table of contents
20%-Proper format including numbering all pages, the use of ink throughout, no torn out pages, correctly signing and dating each experiment, etc.
20%-Modifications to the procedure
10%-Complete listing of chemicals and equipment used; sketches of equipment are also acceptable
20%-Observations of all physical and chemical changes during the procedure.
10%-Summary of physical measurements, specifically mass of product, % yield, melting or boiling point, etc.
10%-Calculations or preliminary data analysis

V. Required Text

Szafran, Z.; Pike, P.M.; Singh, S. Microscale Inorganic Laboratory, John Wiley and Sons: New York, 1990.

VI. Special Resources Requirements

1. Each student is expected to purchase a pair of safety goggles for use in the laboratory.

2. Bound "composition" book to be used as a lab notebook.

VII. Bibliography

1. Angelici, R.J. Synthesis and Technique in Inorganic Chemistry, University Science Books: Mill Valley, CA, 1985.

2. Jolly, W.M. The Synthesis and Characterization of Inorganic Compounds, Prentice-Hall: Englewood Cliffs, NJ, 1970.

3. Mayo, D.W.; Pike, R.M.; Butcher, S.S. Microscale Organic Laboratory, 2nd edition, John Wiley and Sons: New York, 1989.

4. Mills, J.L.; Hampton, M.D. Microscale Laboratory Manual for General Chemistry, Random House: New York, 1988.

5. Szafran, Z.; Pike, P.M.; Singh, S. Microscale Inorganic Laboratory, John Wiley and Sons: New York, 1990.

6. Williamson, K.L. Microscale Organic Experiments, D.C. Heath: Lexington, MA 1987.

Course Analysis Questionnaire

SECTION A: Details of the Course

A1: There is a need for better balance in the current chemistry curriculum which covers four main areas of chemistry: physical, analytical, organic and inorganic. Currently, there are full year courses in all of these except inorganic which has only one required semester, CH 411. We are trying to remedy this situation by reorganizing the entire inorganic curriculum for chemistry majors. Most importantly, there is no required inorganic chemistry lab in the current curriculum. This new course will increase the amount of lab work in synthetic inorganic chemistry in the chemistry majors curriculum. Coupled with a reorganization of CH 113/114 it will provide two semesters of formal instruction in lecture and lab in the area of inorganic chemistry. This course is not to be included in the liberal studies course list.

A2: Other courses that will be changed concurrently are CH 113, CH 114, and CH 412. These have been submitted separately to the UWUCC.

A3: The proposed syllabus of CH 410 and the syllabus of an inorganic lab course already taught in the department, CH 412, are similar. Therefore, this course does follow the format of traditional offerings in the department. It does differ in that "microscale" procedures will be used. This is a laboratory experiment where very small amounts, 0.05 to 0.150 grams, of starting material are used. All other inorganic lab texts (Angelici, 1986 and Jolly, 1970) use 5 to 15 grams to begin an experiment. The reduction in scale by a factor of 100 has the following advantages:

1. The time required to do the lab procedure is reduced by about a factor of three. This is due to the fact that operations and manipulation take less time on smaller amounts of material. The major benefit of this time savings is that a wider variety of experiments can be done in one semester widening the pedagogical impact of the course. <u>This is the most important benefit of this approach</u>.
2. The experiments are safer since smaller quantities of hazardous materials are used.
3. The cost of chemicals is reduced.
4. The cost of chemical waste disposal is sharply reduced.
5. Microscale experiments are routinely used in inorganic research.

This type of laboratory course was initially developed for organic chemistry laboratory where similar techniques are used (see books by Mayo, Pike and Butcher, 1989, and by Williamson, 1987 cited in bibliography). This approach has also begun to be adopted by authors of a freshman chemistry lab text (Mills and Hampton, 1988).

A4: This has never been offered on a trial basis at IUP. However, the experiment "Freidel-Crafts Acylation" of ferrocene (from Mayo, Pike and Butcher, 1989) has successfully been used in CH 412 for two years.

A5: This will not be a dual-level course.

A6: This course cannot be taken for variable level credit.

A7: Similar courses are taught at: Merrimack College, North Andover, MA
Northern Michigan University

A8: This course is required to retain American Chemical Society (ACS) certification of our department's B.S. degree in chemistry. The ACS Committee on Professional Training's (ACS-CPT) guidelines p. 10, states that the required core curriculum must include a course in the synthesis and characterization of inorganic compounds. This has been pointed out by the ACS-CPT (see letter from Barbara Gallagher, dated March 20, 1989) and CH 410 is the way in which we will fulfill this requirement. Although this course is similar to CH 412 we decided to create a new course for three reasons. First, since this will be the students introduction to inorganic synthesis it is necessary to begin at the most elementary level. Second, in CH 410 we can emphasize breadth by preparing a wide variety of inorganic compounds while in CH 412 we can focus in detail on more advanced techniques on a smaller number of compounds. Third, those students that wish to continue in inorganic chemistry can take CH 412 in the spring semester as an elective.

SECTION B: Interdisciplinary Implications

B1: This course will be taught by one instructor.

B2: No other courses are needed as corollaries, however, other inorganic chemistry courses including CH 114, CH 411 and CH 412 are also being revised in response to the request by the ACS-CPT (see Section A) and to eliminate overlap in the content and objective of these courses.

B3: There is no overlap of content in this course with courses in other departments.

B4: No seats in this course will be reserved.

SECTION C: Implementation

C1: Resources

a. No new faculty are needed to teach this course. There are currently four faculty in the chemistry department with the background and experience to teach this course.
b. The course will be taught in the current inorganic laboratory, room 102 of Weyandt Hall.
c. The department currently has all the equipment necessary to carry out all the required lab experiments except for a Thomas-Hoover melting point apparatus (cost~$1000) and centrifuge (~$350).
d. The greatest expense involved in this course will be the initial investment in glassware. Because microscale work requires special glassware not presently on hand, there will be an initial cost of about $2000 to equip the lab with enough kits for all students. The microscale glassware is more durable than typical labware and we envision little replacement costs due to breakage. Due to the small quantities of reagent chemicals and solvents used the cost of supplies should be no more than $500 per year including the first year the course is taught. These expenses and the equipment mentioned above will come from the operating budget of the department.
e. Current library holdings are adequate and all reference books noted in the bibliography are currently in the library or the department.
f. No travel funds will be necessary.

C2: No grants will directly fund the operation of this course. However, a senate grant ($1500) has been funded for 1990-91 that will allow us to test some of the experiments we plan to include in this course.

C3: This course will be offered every year in the fall semester. This will allow the students to take this course concurrently with CH 411, Advanced Inorganic Chemistry. The content in these courses will overlap so that CH 411 will provide the theoretical framework for the experiments in CH 410.

C4: One section of this course will be offered.

C5: Up to 24 students can be accommodated by this course. The course is limited to this number by the number of lab stations in room 102 of Weyandt Hall. We project about 10-12 students per year based on the number of B.S. students receiving ACS certification of their degree.

C6: The American Chemical Society's Committee on Professional Training does not recommend any enrollment limits.

C7: This course will be a curriculum requirement for those students who wish to have ACS certification of their degree. To accommodate this course in the curriculum the number of chemistry electives will be reduced by one (from six to five). This will not change the number of free electives, the number of credits required for the major nor increase the current 124-credit B.S. program in chemistry.

SECTION D: Miscellaneous

Included are the following appendices:

- Selected portions of the ACS-CPT handbook and 1988 extensions.
- Letters from ACS-CPT concerning the inorganic lab and inclusion of descriptive inorganic in IUP's curriculum.

Appendix

1. Letter from American Chemical Society's Committee on Professional Training (ACS-CPT)

2. Selected pages from ACS-CPT handbook