University of Wisconsin-Whitewater

Curriculum Proposal Form #4A

# **Change in an Existing Course**

Type of Action (check all that apply)

[x]  Course Revision (*include course description & former and new syllabus)* [ ]  Grade Basis

[ ]  Contact Hour Change and or Credit Change [ ]  Repeatability Change

[ ]  Diversity Option [ ]  Other:

[ ]  General Education Option

 area:  **\***

\* Note: For the Gen Ed option, the proposal should address how this course relates to specific core courses, meets the goals of General Education in providing breadth, and incorporates scholarship in the appropriate field relating to women and gender.

**Effective Term**:

**Current Course Number** (*subject area and 3-digit course number*): CHEM 460

**Current Course Title**: Advanced Inorganic Chemistry

**Sponsor(s)**: Paul House

**Department(s):** Chemistry

**College(s):**

**List all programs that are affected by this change:**

**chemistry**

If programs are listed above, will this change affect the Catalog and Advising Reports for those programs? If so, have Form 2's been submitted for each of those programs?

(Form 2 is necessary to provide updates to the Catalog and Advising Reports)

[ ]  NA [x]  Yes [ ]  They will be submitted in the future

Proposal Information: ([***Procedures for form #4A***](http://www.uww.edu/acadaff/ucc/Procedures_form4A.docx))

1. **Detailed explanation of changes** (use FROM/TO format)

***FROM:***

CHEM 460 ADVANCED INORGANIC CHEMISTRY 4 u

Atomic and molecular structures, chemical bonding and periodic properties of the elements. Synthesis, characterization and structures of the compounds involving both representative and transition elements, organometallic and bioinorganic compounds and their applications. Group theory and bonding theories. (Fall only)

Prereq: CHEM 252, CHEM 261 and CHEM 352.

Coreq: CHEM 371 or consent of instructor

***TO:***

CHEM 460 ADVANCED INORGANIC CHEMISTRY **3 u**

**A lecture course that continues CHEM 260: Introduction to Inorganic Chemistry. More detailed study of group theory, molecular orbital theory and coordination chemistry. Advanced topics may include organometallic chemistry, bioinorganic chemistry and the application of inorganic chemistry to the environment.**

~~Atomic and molecular structures, chemical bonding and periodic properties of the elements. Synthesis, characterization and structures of the compounds involving both representative and transition elements, organometallic and bioinorganic compounds and their applications. Group theory and bonding theories. (Fall only)~~

Prereq: CHEM 252, **CHEM 260**, CHEM 261 and CHEM 352.

Coreq: ~~CHEM 371~~ CHEM 370 or consent of instructor

## Justification for action

Due to the proposal of CHEM 260: Introduction to Inorganic Chemistry the topics and format of CHEM 460: Advanced Inorganic Chemistry are being changed. CHEM 260 is a lecture/laboratory course that will cover the basics of inorganic chemistry in the lab and so the laboratory portion of CHEM 460 is dropped in this proposal and the course’s credit changed from 4 units to 3 units. The topics covered in CHEM 460 are slightly changed to reflect material introduced in CHEM 260. A number of the same topics will be covered in CHEM 460 but in more depth and/or more quickly. The introduction of CHEM 260 will give the ability to cover advanced topics in CHEM 460 that has been difficult previously.

CHEM 460 has been required in the Biochemistry, Honors and Professional ACS approved emphases of the chemistry major but now will be replaced by CHEM 260. Form 2 has been submitted for each of these programs to make this change.

1. **Syllabus/outline** (if course revision, include former syllabus and new syllabus)

**Former Syllabus**

LECTURE SYLLABUS

CHEM 460, Advanced Inorganic Chemistry (Fall 2011)

(Read this carefully and retain it for reference through the semester)

Instructor: Dr. Baocheng HAN. Phone Number: 472-5122 (O). E-mail: Hanb@uww.edu

Class: M, W, F 1:10 – 2:00 p.m.; RM: UH 236.

Office Hours: M, W: 9:00 - 11:00 a.m.; and M, R: 2:00 -3:00 p.m. or by appointment.

Help Session: T, 3:00-4:00 p.m.

Textbook: G. L. Miesler and D. A. Tarr. Inorganic Chemistry. Prentice Hall. Englewood Cliffs, NJ. 2003,

3rd Edition.

Lab Manual: Handouts distributed and the copies of experiments from;

Angelici, R. J.; “Synthesis and Technique in Inorganic Chemistry”;

Tanaka, J.; Suib, S.;“Experimental Methods in Inorganic Chemistry”, Prentice Hall, Upper Saddle

River, NJ, 1999. (NOT available in the bookstore)

Course Description

Course Objectives: This course is divided into two portions: Lecture and Laboratory. In the lecture, students will learn group theory and its applications in molecular orbital theory and spectroscopic interpretation; basic fundamental knowledge of coordination chemistry; organometallic and bioinorganic compounds and their applications; solid state chemistry and main group chemistry. In addition, atomic and molecular structures, bonding theories, periodic properties of the elements will also be covered. In the laboratory, students will synthesize, isolate and characterize a number of compounds. It is anticipated that some instruments including HPLC, GC, IR, NMR UV-Visible and a Potentiostat will be used, in addition to a vacuum line.

Attendance and Course Structure

Attendance will not be used to determine grades. However, students are responsible for all information and assignments missed due to absence for any reason from lecture or laboratory. Instructors will not give make-up lectures, exams and labs, nor provide notes for missed lectures.

Chemistry, as well as other sciences, is vertically structured. That is, an understanding of new material is critically dependent upon a complete understanding of all preceding material. Thus, it is absolutely essential that one not fall behind the progress of the class. It is also essential to recognize that an understanding of the interrelationships between different concepts and principles is as important as the concepts and principles themselves. Consequently, the mere memorization of information is unlikely to lead to a satisfactory achievement of the objectives of this course.

Missed Exams or Labs

 A missed exam, quiz or lab will be recorded as zero and THERE WILL BE ABSOLUTELY NO “MAKE-UP” EXAMS and LABS GIVEN except for the following three reasons. (1). Religious Beliefs Accommodation: The Board of Regents policy states that students' sincerely held religious beliefs shall be reasonably accommodated with respect to scheduling all examinations and other academic requirements. Students must notify the instructor, within the first three weeks of the beginning of classes of the specific days or dates on which they will request accommodation from an examination or academic requirement. (2). Absence for University Sponsored Events: University policy adopted by Faculty Senate and the Whitewater Student Government states that students will not be academically penalized for missing class in order to participate in university sanctioned events. They will be provided an opportunity to make up any work that is missed; and if class attendance is a requirement, missing a class in order to participate in a university sanctioned event will not be counted as an absence. A university sanctioned event is defined to be any intercollegiate athletic contest or other such event as determined by the Provost. Activity sponsors are responsible for obtaining the Provost's prior approval of an event as being university sanctioned and for providing an official list of participants. Students are responsible for notifying their instructors in advance of their participation in such events. (3) Documented medical emergency.

The University of Wisconsin-Whitewater is dedicated to a safe, supportive and non-discriminatory learning environment. It is the responsibility of all undergraduate and graduate students to familiarize themselves with University policies regarding Special Accommodations, Misconduct, Religious Beliefs Accommodation, Discrimination and Absence for University Sponsored Events. (For details please refer to the Undergraduate and Graduate Timetables; the "Rights and Responsibilities" section of the Undergraduate Bulletin; the Academic Requirements and Policies and the Facilities and Services sections of the Graduate Bulletin; and the "Student Academic Disciplinary Procedures" [UWS Chapter 14]; and the "Student Nonacademic Disciplinary Procedures" [UWS Chapter 17]).

Dropping the Course

If you wish to drop the course, it is your responsibility to obtain, fill out, and get the necessary signatures on an official drop form. You must check out of the laboratory and return your lab drawer key before a drop will be processed.

Academic Misconduct

The University believes that academic honesty and integrity are fundamental to the mission of higher education and of the University of Wisconsin System. The University has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors. Students who violate these standards are subject to disciplinary action. UWS Chapter 14 identifies procedures to be followed when a student is accused of academic miscount.

In this course you are expected to perform to the utmost of you ability in an honest and sincere manner. Cheating, plagiarism, the use of unauthorized materials or any other form of academic misconduct will result in a severe penalty as permitted in UWS Chapter 14. Any person caught cheating in this course will receive a failing grade - F. There are no exceptions or mitigating circumstances. If you cheat and you are caught, you fail.

Evaluation of Student Performance

The performance of a student will be evaluated based on the proficiency in the lecture and lab. We will NOT consider the amount of time one spends on studying the materials covered. We will NOT consider the number of questions in the homework one did or will do. We will NOT consider how well one understands the materials covered either. Finally, we will NOT consider the attendance record of a student unless he/she is on the borderline.

Proficiency in the lecture material will be determines by:

Three (3) regular exams and a comprehensive final exam, each worth of 100 points.

Tentatively: Test #1: Oct. 5 Test #2: Nov. 4 Test #3: Dec. 2

Comprehensive Final: (M) Dec. 19, 2011 (1:00 - 3:00 p.m.)

Numerous problems will be assigned at the end of each chapter. Students are strongly recommended to

solve these problems since some of them will be in an identical and/or similar format as in the tests. A copy

of the solution manual is placed in the Chemistry Department on reserve.

Proficiency in the laboratory will be determined by

(a). Eight formal experiment reports (tentatively), each weighed at 20 points (total 160 points), where the performance of synthesis and characterization of compounds will be weighed most heavily. The due date to turn in your report is two weeks after the experiments are completed. (PLEASE DO NOT ASK FOR EXTENSION OF THE DUE DATE). NO CREDIT WILL BE GIVEN AFTER THE DEADLINE. THANK YOU IN ADVANCE FOR YOUR COOPERATION. Please refer to the handouts regarding lab report grading and write-up. We will use a lab session to discuss how to read a scientific paper, how to repeat the experiments described in a paper and how to write a scientific paper, etc.

(b). a literature research presentation (30 points). Students need to go to the library (or using Web) to find a current inorganic chemistry article on the synthesis and characterization of inorganic compounds. Students need to read, understand and present this article. Evaluation of the presentation will be based on: presentation skills; contents of the presentation; organization; etc.

 (c). lab notebook (20 points). Lab notebook will be collected at the end of the semester for grading

(Dec. 9, 2010). Notebooks WILL NOT be accepted after the due dates. Lab notebook must be a stitch

bound notebook and entries should follow the guidelines found in the lab manual. Your lab notebook

should ALWAYS be current – ready to be collected. If a student is seen for not using a lab notebook,

2 points will be deducted for each occurrence up to 20 points for the semester. A lab notebook is to

be used only when an experiment is conducted. It is not designated to take the lecture notes. Please

refer to the handouts.

Lecture: 4 Exams: 400

Laboratory: 8 reports 8 X 20: 160

Presentation: 30

Lab Notebook: 20

Total: 610

Overall percentage (%) for the whole semester = (Your total scores/ 6.10)

Grade Scale:

A = 95% and above A- = 90%-94%

B+ = 87%-89% B = 83%-86% B- = 80%-82%

C+ = 77%-79% C = 73%-76% C- = 70%-72%

D+ = 67%-69% D = 63%-66% D- = 60%-62%

F = 59% and below

GPA:

A: 4.000 A-: 3.670

B+: 3.330 B: 3.000 B-: 2.670

C+: 2.330 C: 2.000 C-: 1.670

D+: 1.330 D: 1.000 D-: 0.670

F: 0.000

It should be noted that students must complete and submit a minimum of 80% completed experiment reports

and the lab notebook with acceptable grades (at least 60% of the lab grades) in order to pass Chem 460 course. Your Chem 460 semester grade will be based on your proficiency in both the lecture and lab portions.

Your lab reports should be typed, including Title, Introduction, Experimental Section, Results and Discussion, and References. It should be double spaced with Times New Roman Font, size 12. The reports should be about 2-4 pages long and should be stapled with students’ names on them.

TENTATIVE SCHEDULE

Chapter 1, 2 and 3 Introduction/Effective Nuclear Charge/Periodic Trends

Chapter 4 Symmetry and Group Theory

Chapter 5 Molecular Orbitals

Chapter 6 Acid-Base and Donor-Acceptor Chemistry

Chapter 9 and 10 Coordination Chemistry: Bonding/Structures/Isomers

Chapter 11 Coordination Chemistry: Electronic Structure

Chapter 12 Coordination Chemistry: Mechanisms

Chapter 16 Bioinorganic Chemistry

Chapter 13 and 14 Organometallic Chemistry

Chapter 7 Solid State Chemistry

LABORATORY SYLLABUS

(Laboratory: Monday from 2:15 to 5:00 p.m. UH 240; Quant. Lab and Instrumental Lab)

The following experiments, subject to change, will be done in the semester.

#1. Grow Crystals (in gel; recrystallization and slow evaporation).

#2. Ethylenediamine Complexes of Coblat and Nickel.

#3. Synthesis, Purification and Characterization of TPPH2; (IR; NMR; UV-vis)

#4. Synthesis, Purification and Characterization of (TPP)M; M = Cu, Ni and Zn (NMR; UV-vis, ESR).

#5. Synthesis, Purification and Characterization of a (dpf)4Ru2(NO) 2, - reduction technique, Schlenk line, CV, IR.

#6. Synthesis, Purification and Characterization of [VO(acat)2] complex; ESR

#7. Analysis of Acetylated Ferrocene via Friedel-Crafts Reaction with IR.

#8. Magnetic Susceptibility Measurements (Magnetic balance).

In synthesis, students will learn how to design reactions to lead to the desired products. Students will learn Schlenk line techniques, including how to transfer solutions and how to carry out reactions under an inert atmosphere. In purification, students will learn how to use a rotary vaporization to remove solvents, how to purify compounds, including recrystalization, extraction, TLC, column chromatography, and LC. In characterization section, students

will learn how to use various analytical instruments, such as electrochemistry analyzer, FTIR, NMR, GC/MS, UV-

visible, and magnetic balance to identify compounds obtained.

Only preliminary procedures for the experiments will be given. Students need to look for references and design the

experiments. The instructor will assist the students who might need help. This requires students to learn literature

research - the literature search for chemistry references in the library. Students are required to search for some

references regarding the experiments (or lecture materials) to be done. In general, Mondays will be used to discuss

lab report write-up; and to prepare for the experiment in the following week and to learn some techniques used in

the labs. Wednesdays will be used to complete the experiment.

Attendance at Safety Orientation/Check in lab period, which cannot be given on an individual basis, is

MANDATORY. Failure to attend this will result in automatic dismissal from the course (the student will still need

to follow the drop procedure).

If there is anyone in the class who requires special accommodations, they should see Dr. Han. If your health

condition (e.g. pregnant, etc.) prevents you from doing experiment, you should also see Dr. Han.

Safety rules are strictly enforced (see Chemistry Laboratory Safety Rules and Regulations). Violators will have to

leave the laboratory and will result in a grade of ZERO for that experiment. Students must always wear the splash-

proof type of safety goggles in a chemistry laboratory. Also, students are expected to bring their own towels (cloth

or paper) for use in the lab. Students should NOT be running to the bathroom and exhausting the supply of paper

towels and toilet paper.

Students should be aware of the consequences of violating the check-in and check-out policies.

While the laboratory is generally a safe place to explore chemical principles and phenomena, there are things (equipment, reagents, etc.) that can cause injury when misused. For this reason, it is important to be fully alert and focused when in the laboratory. If you attend lab and you fail to follow general laboratory safety practices and

procedures, disregard the written and/or verbal instructions associated with the lab, or are otherwise perceived to

be a risk to yourself or others, you will be asked to leave the lab and may receive a zero for the day.

**New Syllabus**

CHEM 460: Advanced Inorganic Chemistry Syllabus

Instructor: Dr. Baocheng HAN. Phone Number: 472-5122 (O). E-mail: Hanb@uww.edu

Class: M, W, F 1:10 – 2:00 p.m.; RM: UH 236.

Office Hours: M, W: 9:00 - 11:00 a.m.; and M, R: 2:00 -3:00 p.m. or by appointment.

Help Session: T, 3:00-4:00 p.m.

Textbook: G. L. Miesler and D. A. Tarr. Inorganic Chemistry. Prentice Hall. Englewood Cliffs, NJ. 2003,

3rd Edition.

Course Description

Course Objectives: This course is a continuation of CHEM 260: Introduction to Inorganic Chemistry and further explores molecular orbital theory, acid-base theories, group theory and coordination chemistry. In particular the quantitative application of group theory to molecular orbital theory, mechanisms of inorganic reactions and electronic spectra of coordination compounds will be studied. New topics covered include organometallic chemistry, metal-metal bonding, bioinorganic chemistry and inorganic applications in environmental chemistry.

Attendance and Course Structure

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In this course you are expected to perform to the utmost of you ability in an honest and sincere manner. Cheating, plagiarism, the use of unauthorized materials or any other form of academic misconduct will result in a severe penalty as permitted in UWS Chapter 14. Any person caught cheating in this course will receive a failing grade - F. There are no exceptions or mitigating circumstances. If you cheat and you are caught, you fail.

Evaluation of Student Performance

The performance of a student will be evaluated based on performance on three semester exams, a final comprehensive exam and an in class presentation. We will NOT consider the amount of time one spends on studying the materials covered. We will NOT consider the number of questions in the homework one did or will do. We will NOT consider how well one understands the materials covered either. Finally, we will NOT consider the attendance record of a student unless he/she is on the borderline.

Proficiency in the lecture material will be determines by

Three (3) regular exams and a comprehensive final exam, each worth of 100 points.

Tentatively:

Test #1: Friday of week 4 Test #2: Friday of week 8 Test #3: Monday of week 12

Final exam at the specified time during the exam period.

Problems will be assigned at the end of each chapter. Students are strongly recommended to

solve these problems since some of them will be in an identical and/or similar format as in the tests. A copy

of the solution manual is placed in the Chemistry Department on reserve.

A literature research presentation (50 points). Students need to go to the library (or using Web) to find a current inorganic chemistry article on the synthesis and characterization of inorganic compounds. Students need to read, understand and present this article. Evaluation of the presentation will be based on: presentation skills; contents of the presentation; organization; etc.

Lecture: 4 Exams: 400

Presentation: 50

Total: 450

Overall percentage (%) for the whole semester = (Your total scores/ 450)×100%

Grade Scale:

A = 95% and above A- = 90%-94%

B+ = 87%-89% B = 83%-86% B- = 80%-82%

C+ = 77%-79% C = 73%-76% C- = 70%-72%

D+ = 67%-69% D = 63%-66% D- = 60%-62%

F = 59% and below

GPA:

A: 4.000 A-: 3.670

B+: 3.330 B: 3.000 B-: 2.670

C+: 2.330 C: 2.000 C-: 1.670

D+: 1.330 D: 1.000 D-: 0.670

F: 0.000

Course Schedule

Chapter numbers refer to Miessler & Tarr Inorganic Chemistry, 3rd edition.

|  |  |
| --- | --- |
| **Class Meeting** |  **Topic** |
| Week 1: Wednesday | Simple bonding theory (Chpt 3) |
|  Friday | Simple bonding theory (Chpt 3) |
| Week 2: Monday | Symmetry and group theory (Chpt 4) |
|  Wednesday | Symmetry and group theory (Chpt 4) |
|  Friday | Symmetry and group theory (Chpt 4) |
| Week 3: Monday | Symmetry and group theory (Chpt 4) |
|  Wednesday | Molecular orbitals (Chpt 5) |
|  Friday | Molecular orbitals (Chpt 5) |
| Week 4: Monday | Molecular orbitals (Chpt 5) |
|  Wednesday | Review |
|  Friday | **Exam I** |
| Week 5: Monday | Acid-base and donor-acceptor chemistry (Chpt 6) |
|  Wednesday | Acid-base and donor-acceptor chemistry (Chpt 6) |
|  Friday | Coordination chemistry – structures and isomers (Chpt 9) |
| Week 6: Monday | Coordination chemistry – structures and isomers (Chpt 9) |
|  Wednesday | Coordination chemistry – structures and isomers (Chpt 9) |
|  Friday | Coordination chemistry – bonding (Chpt 10) |
| Week 7: Monday | Coordination chemistry – bonding (Chpt 10) |
|  Wednesday | Coordination chemistry – bonding (Chpt 10) |
|  Friday | Coordination chemistry – electronic spectra (Chpt 11) |
| Week 8: Monday | Coordination chemistry – electronic spectra (Chpt 11) |
|  Wednesday | Review |
|  Friday | **Exam II** |
| Week 9: Monday | Coordination chemistry – reactions and mechanisms (Chpt 12) |
|  Wednesday | Coordination chemistry – reactions and mechanisms (Chpt 12) |
|  Friday | Coordination chemistry – reactions and mechanisms (Chpt 12) |
| Week 10: Monday | Organometallic chemistry (Chpt 13) |
|  Wednesday | Organometallic chemistry (Chpt 13) |
|  Friday | Organometallic reactions and catalysis (Chpt 14) |
| Week 11: Monday | Organometallic reactions and catalysis (Chpt 14) |
|  Wednesday | Organometallic reactions and catalysis (Chpt 14) |
|  Friday | Review |
| Week 12: Monday | **Exam III** |
|  Wednesday | Parrallels between main group and organometallic chemistry (Chpt 15) |
|  Friday | No class due to Thanksgiving |
| Week 13: Monday | Parrallels between main group and organometallic chemistry (Chpt 15) |
|  Wednesday | Parrallels between main group and organometallic chemistry (Chpt 15) |
|  Friday | Bioinorganic and environmental chemistry (Chpt 16) |
| Week 14: Monday | Bioinorganic and environmental chemistry (Chpt 16) |
|  Wednesday | Bioinorganic and environmental chemistry (Chpt 16) |
|  Friday | Student presentations |
| Week 15: Monday | Student presentations |
|  Wednesday | Review |
| Exam Week | **Final exam** |