CHEM 411/511 Advanced Inorganic Chemistry-CrsRvs-2017-01-20

- The workflow icon is no longer available. Please click on the Page Status after the orange circle icon near the page title. *

Form Information

The page you originally access is the global template version. To access the template document that progresses through the workflow, please complete the following steps:

First Step: **ONLY** change the text in the [brackets] so it looks like this: **CRIM 101 Intro to Criminology-CrsRvs-2015-08-10**

- ***If DUAL LISTED list BOTH courses in the page title***

Second Step: Click **"SAVE"** on bottom right

- ***DO NOT TYPE ANYTHING INTO THE FIRST PAGE OTHER THAN THE TEXT IN BRACKETS***
- ***Please be sure to remove the Brackets while renaming the page***

Third Step: Make sure the word ***DRAFT*** is in yellow at the top of the proposal

Fourth Step: Click on "**EDIT CONTENTS**" (not EDIT) and start completing the template. When exiting or when done, click **"SAVE"** on bottom right

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**Indicates a required field*

Proposer*	Avijita Jain	**Proposer Email***	avijita@iup.edu
Contact Person*	Avijita Jain	**Contact Email***	avijita@iup.edu
Proposing Department/Unit*	Chemistry	**Contact Phone***	7-2361

Course Level*	graduate-level, undergraduate-level

Course Revisions **(Check all that apply;fill out categories below as specified; i.e. if only changing a course title, only complete Category A)**	
Category A:	Category B: add dual level ** Teacher Education: Please complete the Teacher Education section of this form (below)* ** Liberal Studies: Please complete the Liberal Studies section of this form (below)* ** Distance Education: Please complete the Distance Education section of this form (below)*

Rationale for Proposed Changes (All Categories)	
(A) Why is the course being revised /deleted:*	We are revising this course so that Graduate students in the Professional Science Masters (PSM) program can take advantage of this advanced level course. At the graduate level, this dual listed course will act as introduction to the Inorganic lab course.

(B) University Senate Summary of Rationale*	*Please enter a single paragraph summary/rationale of changes or proposal for University Senate.* The experience of a graduate student will differ from that of an undergraduate students in both quantitative and qualitative ways. The major difference between 411 and 511 will be in the type of project a student selects in the second half of the semester. Graduate students will be expected to select projects that are more challenging in terms of synthesis, purification and properties of the molecules they wish to study. Graduate students will be expected to design and implement their advance projects more independently and include a more extensive literature review, written proposal and discussion of their outcomes. Graduate students will be held to a higher standard of performance than undergraduates. Graduate students will be expected to produce better organized and more detailed report at the end of their project than undergraduate students. Graduate students will be expected to demonstrate superior skills in the understanding of scientific concepts than undergraduate students. The instructor will have separate grading scales for graduate and undergraduates. Students will be evaluated based on exams, quizzes and laboratory work. In addition, graduate students will also be evaluated based on their research proposal, research project in lab and research summary.
(C) Implications of the change on the program, other programs and the Students:*	Both undergraduate and graduate students in Chemistry department will benefit with this change.

Current Course Information*	
Category A	
(D) Current Prefix*	CHEM
Proposed Prefix	CHEM
(E) Current Number*	411
Proposed Number	411/511
(F) Current Course Title*	Advanced Inorganic Chemistry
Proposed Course Title	Advanced Inorganic Chemistry
(G) Prerequisite(s)	CHEM 214, 341
Proposed Prerequisite(s)	CHEM 214, 341 or graduate standing
(H) Current Catalog Description	CHEM 411 Advanced Inorganic Chemistry Prerequisites: CHEM 214, 341 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.
Proposed Catalog Description	CHEM 411/511 Advanced Inorganic Chemistry Prerequisites: CHEM 214, 341 or graduate standing 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
If changing Category A, no further action required.	
Category B (if no change, leave blank)	

(I) Repeatable Course	If YES, please complete the following: Number of Credits that May be Repeated: Maximum Number of Credits Allowed to be Repeated:
Proposed Repeatable Course	If YES, please complete the following: Number of Credits that May be Repeated: Maximum Number of Credits Allowed to be Repeated:
(J) Number of Credits	Class Hours: Lab Hours: Credits:
Proposed Number of Credits	Class Hours:Lab Hours:Credits:
(K) Current Course (Student Learning) Outcomes	
Proposed Course (Student Learning) Outcomes	
(L) Dual Listed Courses Only: List Current Learning Outcomes for the Higher-Level Course	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.

Dual Listed Courses Only: **List Proposed Learning** **Outcomes for the** **Higher-Level Course**	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. In addition, the Graduate students will be able to: 1. Independently design and develop a research plan related to synthesis characterization or studies of inorganic compounds 2. Perform experiments in the laboratory to validate proposed research plan 3. Summarize research findings
(M) Brief Course Outline *(It is acceptable to copy* *from old syllabus)*	*As outlined by the federal definition of a "credit hour", the following should be a consideration* *regarding student work - For every one hour of classroom or direct faculty instruction,* *there should be a minimum of two hours of out of class student work.* 1. Review of Atomic Structure. 2. Spectra and orbitals, ionization energy, electron affinity, shielding and effective nuclear charge. 3. Covalent Molecular Substances 4. 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 irreduciblerepresentations, multi-centered MO, electron-deficient molecules, –donorand acceptor ligands). 5. Exam #1 6. Transition Elements and Coordination Chemistry. 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. 7. Exam #2 8. Organometallic Chemistry. 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). 9. Special Topics. Catalysis and important industrial processes, condensed materials containing chain, ring, sheet, cage, and network structures, supramolecular structures, nanoscale structures and effects 10. Final Examination (during Final Examination Period)

Brief Course Outline For each outcome, describe how the outcome will be achieved *(Give sufficient detail to communicate the* *content to faculty across campus.* *It is not necessary to include specific* *readings, calendar or assignments)*	*As outlined by the federal definition of a "credit hour", the following should be a consideration* *regarding student work - For every one hour of classroom or direct faculty instruction,* *there should be a minimum of two hours of out of class student work.* For lecture, students will attend lectures, participate in discussions, and will be tested on following concepts 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. For laboratory work, students will work in the laboratory to 12. Prepare of a variety of inorganic compounds. 13. Characterize a variety of inorganic compounds by spectroscopic methods. Students will be evaluated based on exams, quizzes and laboratory work. In addition, graduate students will also be evaluated based on their research proposal, research findings and research summary. These additional requirements meet our department's expectations for graduate students.

Distance Education Section

- Complete this section only if adding Distance Education to a New or Existing Course

If Completing this Section, **Check the Box to the Right:**	**NOTE: you must check this box if the Course has previously been approved for Distance Education**
Course Prefix/Number	
Course Title	
Type of Proposal	*See CBA, Art. 42.D.1 for Definition*
Brief Course Outline	*Give an outline of sufficient detail to communicate the course content to faculty across campus. It is not necessary to include specific readings, calendar or assignments* *As outlined by the federal definition of a "credit hour", the following should be a consideration regarding student work - For every one hour of classroom or* *direct faculty instruction, there should be a minimum of two hours of out of class student work.*
Rationale for Proposal (Required Questions from CBA)	
How is/are the instructor(s) qualified **in the Distance Education delivery** **method as well as the discipline?**	

For each outcome in the course, describe **how the outcome will be achieved using** **Distance Education technologies.**	
How will the instructor-student and **student-student interaction take place?** **(if applicable)**	
How will student achievement be evaluated?	
How will academic honesty for tests **and assignments be addressed?**	

Liberal Studies Section

- Complete this section only for a new Liberal Studies course or Liberal Studies course revision

If Completing this Section, **Check the Box to the Right:**	**NOTE: you must check this box if the Course/Program has previously been approved for Liberal Studies**

Liberal Studies Course Designations (Check all that apply)	
Learning Skills:	
Knowledge Area:	
Liberal Studies Elective	*Please mark the designation(s) that apply - must meet at least one*
Expected Undergraduate Student **Learning Outcomes** **(EUSLOs)**	*Describe how each Student Learning Outcome in the course enables students to become Informed Learners, Empowered Learners and/or Responsible Learners* *See http://www.iup.edu/WorkArea/DownloadAsset.aspx?id=181694*
Description of the Required **Content for this Category**	*Narrative on how the course will address the Selected Category Content*
All Liberal Studies courses are required to include perspectives on cultures and have a supplemental reading. **Please answer the following questions.**	

Liberal Studies courses must include the perspectives and contributions of ethnic and racial minorities and of women whenever appropriate to the subject matter. Please explain how this course will meet this criterion.	
Liberal Studies courses require the reading and use by students of at least one non-textbook work of fiction or non-fiction or a collection of related articles. Please describe how your course will meet this criterion.	

Teacher Education Section

- Complete this section only for a new Teacher Education course or Teacher Education course revision

If Completing this Section, Check the Box to the Right:	**NOTE: you must check this box if the Course/Program has previously been approved for Teacher Education related items**
Course Designations:	
Key Assessments	
	For both new and revised courses, please attach (see the program education coordinator): • The Overall Program Assessment Matrix • The Key Assessment Guidelines • The Key Assessment Rubric **File** **Modified** No files shared here yet. • Drag and drop to upload or browse for files
Narrative Description of the Required Content	*How the proposal relates to the Education Major*

Please scroll to the top and click the Page Status if you are ready to take action on the workflow.
Please submit an ihelp if you have any questions http://ihelp.iup.edu