CHEM 561 Modern Diffraction-DEAdd-2019-03-18

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Form Information

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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***

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**Indicates a required field*

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Proposing Department/Unit*	Chemistry	**Contact Phone***	724 357-4477

Course Level*	graduate-level

Distance Education Section

*- Complete this section only if adding Distance Education to a New or Existing Course - If adding to an Existing Course - please check to see if it has already been approved HERE (On Documents Page) - **before** completing the form*

NOTE - if already approved - a new proposal DOES NOT NEED TO BE COMPLETED

Course Prefix /Number*	CHEM 561
Course Title*	Modern Diffraction
Type of Proposal*	*See CBA, Art. 42.D.1 for Definition* online

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.* (a) Introduction, Radiation Safety, Point Symmetry (b) Lattices, Space Groups, Interpreting International Table for Crystallography (c) Formalization of Symmetry (d) Radiation Production, Fundamentals of Diffraction (e) Scattering Factors, Structure Factors and Systematic Absences (f) Structure Elucidation (g) Single Crystal Crystallography, Introduction to SHELX Program Package (h) Powder Diffractometry, Introduction to GSAS Program Package (i) Powder Diffraction Indexing and Phase Analysis (j) Introduction to Crystallographic Data Bases and Rietveld Analysis (k) Structure Solution from Powders, Introduction to EXPO2009 Software (l) Crystal Structure Interpretation and Result (m) Solving scientific problems with crystallographic results
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?***	I have taught undergraduate (CHEM 105: The Forensic Chemistry of CSI) and graduate (CHEM 630: Essentials of Structure and Reactivity for Industrial Organic Applications) via distance education for multiple years. I hold a PhD in Chemistry from the University of Connecticut and have been a professor in the Chemistry Department at IUP since 2009. I have used many self-made multimedia elements to enhance my course offerings including adaptive quizzes in the LMS, YouTube videos, Camtasia, SCORM lecture content, screen capture, enhanced mechanistic drawings, online exams, online essays, forums, and video explanations.

For each outcome in the course, describe **how the outcome will be achieved using** **Distance Education technologies. ***	The Student will be able to: **1. Demonstrate basic proficiency in crystallography:** *How objective #1 will be met:* Assigned readings from the text, supplemental materials, course videos will be used to introduce crystallography. Students will use online discussion boards to introduce and relate at least one application found in the chemical industry. Quizzes, located on the learning management system, will be used to help keep students on track with required reading and online lectures. The final exam will assess the material which will be scanned and turned in on the learning management software. The exam will include essay, long answer, and mechanistic questions mainly, but may also include no more than 20% multiple choice. **2. Demonstrate proficiency in X-ray data collection:** *How objective #2 will be met:* Assigned readings from the text, supplemental materials and course videos will be used illustrate means of collecting X-ray data. Students will use online discussion boards to introduce and relate at least one application found in the chemical literature. Quizzes, located on the learning management system, will be used to help keep students on track with required reading and online lectures. The final exam will be scanned and turned in on the learning management software. The exam will include essay, long answer, and multiple choice questions mainly, but may also include no more than 20% multiple choice. Students will write a short report that summarizes the methods used to collect crystallography data published in the chemistry literature. Topics from this objective will be selected by students for their written report. Drafts will be due two weeks early to provide feedback on scientific writing as well as content. **3. Elucidate, refine and evaluate crystal structure from X-ray diffractograms:** *How objective #3 will be met:* Assigned readings from the text, supplemental materials and course videos will be used illustrate means of data reduction refinement as well as techniques in structure elucidation. Students will use online discussion boards to introduce and relate at least one application found in the chemical literature. Quizzes, located on the learning management system, will be used to help keep students on track with required reading and online lectures. The final exam will be scanned and turned in on the learning management software. The exam will include essay, long answer, and multiple choice questions mainly, but may also include no more than 20% multiple choice. Students will write a short report that summarizes the methods used to collect crystallography data published in the chemistry literature. Topics from this objective will be selected by students for their written report. Drafts will be due two weeks early to provide feedback on scientific writing as well as content. **4. Interpret crystal structures and use the information to solve scientific problems:** *How objective #4 will be met:* Assigned readings from the text, supplemental materials (including industrial case studies), and course videos will be used as foundational materials to exemplify how the interpretation of crystal structures are used to solve scientific problems relevant in modern crystallography. Students will use online discussion boards to introduce and relate at least one application found in the chemical literature. Quizzes, located on the learning management system, will be used to help keep students on track with required reading and online lectures. The final exam will be scanned and turned in on the learning management software. The exam will include essay, long answer, and multiple choice questions mainly, but may also include no more than 20% multiple choice. Students will write a short report that summarizes the application of a solved crystal structure. Topics from this objective will be selected by students for their written report. Drafts will be due two weeks early to provide feedback on scientific writing as well as content. **5. Give and defend a scientific poster presentation on any related topic:** How objective #5 will be met: Students will be required to complete a guided search of relevant literature that will serve as the basis of their two written reports that delve deeper into the applications of crystallography. In-depth feedback will be provided for guidance and assessment on their scientific writing ability. Narrated Powerpoints will be used to present scientific posters with itube providing platform access. **6. Read and critique related scientific literature:** How objective #6 will be met: Students will select three related relevant articles that will serve as the basis of an additional, in-depth written report into the applications of crystallography. This assignment will occur in the last 1/3 of the course content, with the aim of students utilizing previous feedback on earlier reports to substantiate good scientific communication with regard to modern crystallography. Turnitin will be used. **7. Give and defend a 20 min oral presentation on any current topic related to modern diffraction, applying course material:** How objective #7 will be met: Students will make a 20-minute video presentation using Powerpoint and itube based on their written report (objective 6). The discussion forum will be key to promoting student-student interaction through reply posts assisting students further exposure to in-depth topics.
How will the instructor-student and **student-student interaction take place?*** **(if applicable)**	The learning management system provides multiple opportunities for students to interact with the instructor and with other students through an online class discussion board. Students will also interact with the instructor through completion of online tests and quizzes using email and will also have access to the instructor throughout the course for additional questions and assistance. Online office hours will be available. There will be an emphasis on the editing and review of the midsemester written report.

How will student achievement be evaluated?	The course is divided into one introductory plus four main units. Weekly quizzes will be given to encourage students to keep up with the material. These quizzes will include multiple choice, long answer and matching questions. After each main unit, tests will be administered. Due to the course management system's inability to accurately allow structural drawings and critical answers, exams will be supplied as a pdf that the students will download and print. Students will complete the exam, scan, and upload the exam before the deadline. Typically, 3 days will be given to complete the exam. Academic honesty statements will be included on each of the tests for students to sign. Students will develop oral presentations to the course and write research papers related to a course topic. The goal of the research paper is to develop an in-depth understanding of the particular topic while strengthening professional writing skills. Detailed rubrics will be provided to students and utilized by the instructor for all assignments.
How will academic honesty for tests and assignments be addressed?*	The course syllabus will include the university academic integrity policy. The expectation for academic integrity and the penalty for dishonesty will be clearly stated. Quizzes will use timed tests, random selection of questions and limit on attempts. Feedback will be provided only after quizzes end. Written papers will be submitted through a plagiarism software. All of the above examples are methods the instructor can use to prevent academic dishonesty. Academic integrity will be described on the course syllabus as follows: Academic Honesty Policy: Shall be in accordance with the Indiana University of Pennsylvania Honesty Policy (IUP Student Handbook- Academic Integrity Policy and Procedures, see http://www.iup.edu/registrar/catalg/acapolicy).

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