

LSC Use Only Proposal No:

LSC Action-Date: App-2/21/13UWUCC Use Only Proposal No: 12-86cUWUCC Action-Date: App-3/12/13Senate Action Date: App-3/26/13

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

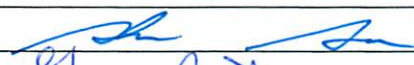
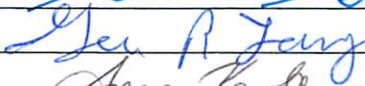
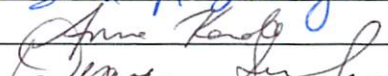

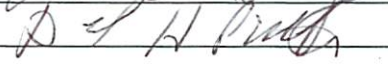

Contact Person(s) Ronald See	Email Address rfsee@iup.edu
Proposing Department/Unit Chemistry	Phone 7-4489

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

Current course prefix, number and full title: _____Proposed course prefix, number and full title, if changing: _____**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 OtherCurrent program name: Bachelor of Science - ChemistryProposed program name, if changing: _____

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)		4/12/12
Department Chairperson(s)		4/12/12
College Curriculum Committee Chair		4/20/12
College Dean		5/13/12
Director of Liberal Studies (as needed)		2/22/13
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs		3/12/13

Received

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Liberal Studies

Part II. Description of Curriculum Change

Bachelor of Science – Chemistry

Liberal Studies: As outlined in the Liberal Studies section with the following specifications: Mathematics: MATH 125 Natural Sciences: PHYS 131-141 and 132-142 Liberal Studies Elective: 3cr, MATH 126, no courses with CHEM prefix		44
Major: Required Courses:		50
CHEM 111 (General Chemistry I) or CHEM 113 (Advanced General Chemistry I)		4
CHEM 112 (General Chemistry II) or CHEM 114 (Advanced General Chemistry II)		4
CHEM 214	Intermediate Inorganic Chemistry	3
CHEM 231	Organic Chemistry I	4
CHEM 232	Organic Chemistry II	4
CHEM 290	Chemistry Seminar I	1
CHEM 325	Analytical Chemistry I	4
CHEM 326	Analytical Chemistry II	4
CHEM 341	Physical Chemistry I	4
CHEM 343	Physical Chemistry Laboratory I	1
CHEM 342	Physical Chemistry II	3
CHEM 344	Physical Chemistry Laboratory II	1
CHEM 390	Chemistry Seminar II	1
CHEM 411	Advanced Inorganic Chemistry	3
CHEM 490	Chemistry Seminar III	1
CHEM 498	Problems in Chemistry	2
BIOC 301	Foundations of Biochemistry	3
Controlled Electives:		
At least 3cr additional CHEM or BIOC at or above the 300-level		3
Other Requirements:		10
BIOL 111	Principles of Biology I	4
MATH 225	Calculus III for Physics, Chemistry, and Mathematics	3
One course from the following: MATH 171, 216, 241		3
Free Electives:		16
Total Degree Requirements:		120

Note: The proposed program eliminates the foreign language requirement.

Appendix A – Suggested Sequence for the B.A. in Chemistry

Side-by-side comparison

Present			Proposed		
Bachelor of Science – Chemistry					
Liberal Studies:		44	Liberal Studies:		44
Mathematics: MATH 125			Mathematics: MATH 125		
Natural Sciences: PHYS 131-141 & 132-142			Natural Sciences: PHYS 131-141 & 132-142		
Liberal Studies Elective: 3cr			Liberal Studies Elective: 3cr, MATH 126		
Required Courses		45	Required Courses		50
CHEM 113	Concepts in Chem I	4	CHEM 111 or CHEM 113		4
CHEM 114	Concepts in Chem II	4	CHEM 112 or CHEM 114		4
CHEM 214	Interm. Inorganic Chem	2	CHEM 214	Interm. Inorganic Chem	3
CHEM 231	Organic Chem I	4	CHEM 231	Organic Chem I	4
CHEM 232	Organic Chem II	4	CHEM 232	Organic Chem II	4
			CHEM 290	Chemistry Seminar I	1
CHEM 301	Intro to Research	1	CHEM 390	Chemistry Seminar II	1
CHEM 321	Quantitative Analysis	4	CHEM 325	Analytical Chemistry I	4
CHEM 322	Instrumental Analysis	4	CHEM 326	Analytical Chemistry II	4
CHEM 341	Physical Chem I	4	CHEM 341	Physical Chem I	4
CHEM 342	Physical Chem II	3	CHEM 342	Physical Chem II	3
CHEM 343	Physical Chem I Lab	1	CHEM 343	Physical Chem I Lab	1
CHEM 344	Physical Chem II Lab	1	CHEM 344	Physical Chem II Lab	1
CHEM 410	Adv. Inorganic Chem Lab	1			
CHEM 411	Adv. Inorganic Chem	3	CHEM 411	Adv. Inorganic Chem	3
			CHEM 490	Chemistry Seminar III	1
CHEM 498	Problems in Chem	2	CHEM 498	Problems in Chem	2
			BIOC 301	Foundations of Biochemistry	3
Controlled Electives			Controlled Electives		
additional chemistry elective from the following: CHEM 331, 335, 421, 441, 481		3	At least 3cr CHEM or BIOC at or above the 300-level		3
Other Requirements		16-20	Other Requirements		10
BIOC 301	Biochemistry I	3			
BIOL 111	Principles of Biology I	4	BIOL 111	Principles of Biology I	4
MATH 126	Calculus II	3			
MATH 225	Calculus III	3	MATH 225	Calculus III	3
	Foreign Language	0-3			
One of the following: MATH 171, 216, 241 or 342		3-4	One of the following: MATH 171, 216 or 241		3
Free Electives		11-15	Free Electives		16
Total Degree Requirements		120	Total Degree Requirements		120

- (1) CHEM 111 and 112 can be substituted for CHEM 113 and 114.
- (2) Qualifying students can also use 500- or 600-level courses to meet this requirement.
- (3) Intermediate-level foreign language may be included in Liberal Studies elective.

Changes in course offerings

New courses:

CHEM 290 – Chemistry Seminar I (proposal approved by Senate 10/9/12)

CHEM 325 – Analytical Chemistry I (replaced CHEM 321 Quantitative Analysis)

CHEM 326 – Analytical Chemistry II (approved at Senate, 10/9/12)

CHEM 390 – Chemistry Seminar II (approved at Senate, 11/6/12)

CHEM 490 – Chemistry Seminar III (approved at Senate, 11/6/12)

Existing courses new to the program:

CHEM 111 – General Chemistry I

CHEM 112 – General Chemistry II

Deleted courses

CHEM 301 – Introduction to Research

CHEM 321 – Quantitative Analysis

CHEM 322 – Instrumental Analysis

CHEM 410 – Advanced Inorganic Lab (deletion approved by Senate 11/6/12)

Revised Courses

CHEM 214 – Intermediate Inorganic Chemistry (approved at Senate 10/9/12)

CHEM 231 – Organic Chemistry I (approved at Senate 10/9/12)

CHEM 232 – Organic Chemistry II (approved at Senate 12/4/12)

CHEM 341 – Physical Chemistry I (approved at Senate 5/1/12)

CHEM 342 – Physical Chemistry II (approved at Senate 11/6/12)

CHEM 411 – Advanced Inorganic Chemistry (approved at Senate 11/6/12)

Re-named and revised courses:

CHEM 113 – Advanced General Chemistry I (formerly Concepts in Chemistry I, approved at Senate 4/17/12)

CHEM 114 – Advanced General Chemistry II (formerly Concepts in Chemistry II, approved at Senate 4/17/12)

Rationale for Changes

1. Certification requirements of the American Chemical Society (ACS) – The ACS offers certification of undergraduate degree programs in chemistry, through its Committee on Professional Training. Their requirements include “foundation” courses, of at least three credit hours each, in the five fundamental areas (analytical, biochemistry, inorganic, organic and physical) of chemistry. The complete overhaul of the analytical course offerings, and the revision of the inorganic and physical chemistry courses, are proposed in response to the ACS requirements.
2. Streamlining of departmental offerings – a welcome benefit of this new curricular structure is the ability to eliminate some courses that are now redundant. CHEM 340 was a requirement of the Biochemistry program, but the updated syllabus of record for CHEM 341 allows this course to meet the needs of both the Chemistry and Biochemistry majors. The new CHEM 325 should be an excellent fit for chemistry majors, and those students (Biochemistry, Environmental Science) who now take CHEM 323. Due to this streamlining, we can propose the deletion of both CHEM 323 and 340.
3. Increased focus on undergraduate research – An aspect of our department that we would like to foster in this program revision is undergraduate research. Accordingly, the present 1-credit course CHEM 301 is to be replaced by a series of three 1-credit courses: 1) CHEM 290, which introduces the students to undergraduate research, and assists them in choosing a mentor; 2) CHEM 390, which teaches useful skills concerning chemical literature, and writing a proposal; 3) CHEM 490, which teaches scientific presentation skills.
4. Changes in General Chemistry – Based on tracking data for chemistry majors, we have decided to change CHEM 113 and 114 from a course reserved for Chemistry and Biochemistry majors to a course designed for advanced students of any major. Therefore, the Freshman Chemistry requirement has been changed to an option of 111/112 or 113/114. In reality, nearly half of our graduates in chemistry have historically taken CHEM 111 & 112, so formally including this option is more an admission of reality than an actual change in our program.

Part III. Implementation. Provide answers to the following questions:

1. How will the proposed revision affect students already in the existing program?

The courses required for the existing Chemistry B.S. program are either retained, or replaced by analogous new courses. Therefore, students will have the option of graduating under the old or new curriculum.

2. 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.

Taken as a whole, the changes in this proposal will result in a reduction of 8-9 workload hours taught by the chemistry department faculty, and two less preps. Therefore, the present faculty allotment of the chemistry department will continue to be adequate, and less workload hours of temporary faculty will be required.

3. Are other resources adequate? (Space, equipment, supplies, travel funds)

The proposed changes will not introduce any additional strain on these resources.

4. Do you expect an increase or decrease in the number of students as a result of these revisions? If so, how will the department adjust?

The proposed revision is not expected to change the number of students in the program.

Part IV. Periodic Assessment

There are four components of assessment listed and described in the ACS-CPT's (American Chemical Society's Committee on Professional Training) Departmental Self-Evaluation Supplement. These are:

- 1) Review Mission, Goals and Objectives
- 2) Collect Data on Objectives
- 3) Analyze Data and Determine Changes
- 4) Implement Changes and Re-Evaluate

These principles of assessment apply to the development, data collection, analysis and changes in curriculum based on student learning outcomes. The student learning outcomes used in these assessment tools are based on the Characteristics of Student Competencies in Rigorous Undergraduate Programs described in the ACS-CPT supplement: Rigorous Undergraduate Chemistry Programs.

There are three components proposed for the periodic assessment of this degree program. One is a survey of the senior students completing the degree program, one is the Diagnostic of Undergraduate Chemical Knowledge (DUCK) exam provided by the American Chemical Society's Exam Institute, and the other is a five-year re-certification of the program by the

American Chemical Society's Committee on Professional Training (ACS CPT). The results from the questionnaires and DUCK exam will be examined and analyzed by the Curriculum Committee of the Department each year and the results reported to the faculty. The recommendations from the ACS CPT will also be reviewed and reported to the faculty. During each Five-year program review, the Curriculum Committee will then review all the data collected and determine what changes, if any, are needed in the program and recommend them to the Chemistry Department for action.

Senior Survey – A questionnaire will be given to students who are in the last semester of their degree program. This questionnaire will address the graduates' perceptions of whether they have achieved the program learning outcomes set by the Chemistry Department. It will also have the students indicate where they plan to go once they leave IUP and the strengths & weaknesses of the program.

DUCK Exam - Students in their last semester will be given the Diagnostic of Undergraduate Chemical Knowledge (DUCK) exam provided by the American Chemical Society's Exam Institute. The student's scores will be compared to the published national norms for this exam.

Five-year Review – The American Chemical Society evaluates the B.S. degree programs for certification every five years and requires an interim report every year. The Chemistry Department will carefully consider for implementation, the recommendations of the American Chemical Society Committee on Professional Training. The five-year ACS review is a thorough examination of program content by a uniquely qualified extramural agency. The review results in specific recommendations for improvement when weaknesses are detected. Since continued certification of the program depends on the outcomes of this review, it represents a very important means of assessment.

Part V. Course Proposals (all now approved)

CHEM 214 – Intermediate Inorganic Chemistry

CHEM 231 – Organic Chemistry I

CHEM 232 – Organic Chemistry II

CHEM 290 – Chemistry Seminar I

CHEM 326 – Analytical Chemistry II

CHEM 342 – Physical Chemistry II

CHEM 390 – Chemistry Seminar II

CHEM 411 – Advanced Inorganic Chemistry

CHEM 490 – Chemistry Seminar III

Part VI. Letters of Support or Acknowledgement**This message was sent to Sean McDaniel, Chair of Foreign Languages, on April 3, 2012:**

Sean,

The Chemistry Department is conducting a curriculum revision, and, sadly, we have decided to remove our foreign language requirement. We recognize that learning another language can be an important addition to the college experience, but we feel that there are other learning experiences that are more pertinent to our major's preparation as scientists. Since our Dean wants us to adhere to the 60-credit limit for B.S. degree programs, we simply can no longer justify the inclusion of a foreign language requirement at the expense of these other courses. Please feel free to respond to me concerning this proposed change in our curriculum.

Ron See

Chemistry Department Curriculum Committee

There has been no response from Dr. McDaniel

Appendix A
B.S. – Chemistry
Suggested Sequence

1st Semester		cr	2nd Semester		cr
CHEM 111 or 113		4	CHEM 112 or 114		4
MATH 125	Calculus I	3	CHEM 290	Chemistry Seminar I	1
BIOL 111	Principles of Biology I	4	MATH 126	Calculus II	3
ENGL 101	College Writing	3		Fine Arts	3
			LS History (HIST 196, 197 or 198)		3
			HPED 143	Health & Wellness	3
		14			17
3rd Semester			4th Semester		
CHEM 231	Organic Chemistry I	4	CHEM 232	Organic Chemistry II	4
MATH 225	Calculus III	3	CHEM 214	Inter. Inorganic Chemistry	3
PHYS 131	Physics I Lecture	3	PHYS 132	Physics II Lecture	3
PHYS 141	Physics I Lab	1	PHYS 142	Physics II Lab	1
ENGL 121	Humanities Literature	3	ENGL 202	Research Writing	3
		14			14
5th Semester			6th Semester		
CHEM 325	Analytical Chemistry I	4	CHEM 326	Analytical Chemistry II	4
CHEM 341	Physical Chemistry I	4	CHEM 342	Physical Chemistry II	3
CHEM 343	Physical Chem I Lab	1	CHEM 344	Physical Chem II Lab	1
CHEM 390	Chemistry Seminar II	1	CHEM 498	Problems in Chemistry	1
	Phil/Relig. Studies	3		Social Science course	3
	Social Science course	3		Free elective	3
		16			15
7th Semester			8th Semester		
BIOC 301	Found. of Biochemistry	3		CHEM/BIOC Elective	3
CHEM 411	Adv. Inorganic Chemistry	3	CHEM 490	Chemistry Seminar III	1
CHEM 498	Problems in Chemistry	1		Social Science course	3
	MATH Elective	3		Free Electives	7
	Free Electives	6			
		16			14