

LSC Use Only Proposal No:

LSC Action-Date: App-2/21/13

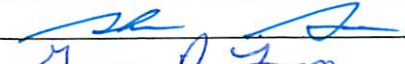
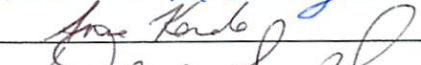
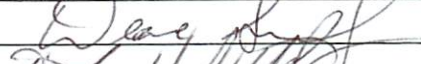
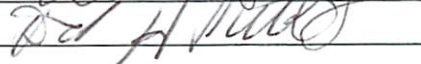
UWUCC Use Only Proposal No: 12-86a

UWUCC Action-Date: App-3/12/13 Senate 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 <u>Current course prefix, number and full title:</u> _____ <u>Proposed course prefix, number and full title, if changing:</u> _____		
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 <u>Current program name:</u> Bachelor of Arts - Chemistry <u>Proposed program name, if changing:</u> _____		
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

FEB 14 2013

Liberal Studies

Part II. Description of Curriculum Change

Bachelor of Arts – Chemistry

Liberal Studies: As outlined in the Liberal Studies section with the following specifications: Mathematics: MATH 125 Natural Sciences: PHYS 111-112 and 121-122 or 131-141 and 132-142 Liberal Studies Elective: 3cr, MATH 126, no courses with CHEM prefix		44
Major: Required Courses:		35
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 341	Physical Chemistry I	4
CHEM 343	Physical Chemistry Laboratory I	1
BIOC 301	Foundations of Biochemistry	3
Controlled Electives:		
At least 3cr additional CHEM or BIOC at or above the 300-level		3
Other Requirements:		22-25
BIOL 111	Principles of Biology I	4
One course from the following: MATH 171, 216, 225 or 241		3
Planned program in complementary field (1)		15-18
Free Electives: (2)		16-19
Total Degree Requirements:		120

- (1) Complementary field programs have been established for the following areas: Art, Business and Economics, Geoscience, Math and Computing, Physics and Material Science, Philosophy, Pre-Medical and Public Policy. Programs in other areas are also possible – they must include a minimum of 15cr, with at least 6cr at or above the 300-level, and be approved by the advisor and department chair.
- (2) Program contains one writing-intensive course (CHEM 343), students need to acquire another W-course in Liberal Studies, or as a free elective.

Note: The proposed program eliminates the foreign language requirement.

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

Appendix B – Established Complementary Field programs.

Side-by-side comparison

Present			Proposed		
Bachelor of Arts – Chemistry					
Liberal Studies: Mathematics: MATH 125 Natural Sciences: PHYS 111-121 & 112-122 or 131-141 & 132-142 Liberal Studies Elective: 3cr		44	Liberal Studies: Mathematics: MATH 125 Natural Sciences: PHYS 111-121 & 112-122 or 131-141 & 132-142 Liberal Studies Elective: 3cr, MATH 126		44
Required Courses		30-33	Required Courses		35
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 321	Quantitative Analysis	4	CHEM 325	Analytical Chemistry I	4
CHEM 341	Physical Chem I	4	CHEM 341	Physical Chem I	4
CHEM 343	Physical Chem I Lab	1	CHEM 343	Physical Chem I Lab	1
			BIOC 301	Found. of Biochemistry	3
Controlled Electives – 3-6cr from the list: at least 3cr from the following: CHEM 301, 322, 335, 342, 351, 410, 411, BIOC 310, 302, 311		3-6	Controlled Electives At least 3cr CHEM or BIOC at or above the 300-level		3
Other Requirements		21-24	Other Requirements		22-25
MATH 126	Calculus II	3	BIOL 111	Principles of Biology I	4
MATH 225	Calculus III	3	One course from the following: MATH 171, 216, 225 or 241		3
	Foreign Language	0-3			
Planned program (with advisor approval) in complementary field of at least 15cr, with at least 6cr of 300/400 level courses		15	Planned program in complementary field		15-18
Free Electives		19-25	Free Electives		16-19
Total Degree Requirements		120	Total Degree Requirements		120

- (1) CHEM 111 and 112 can be substituted for CHEM 113 and 114.
- (2) Students electing a concentration in pre-medicine must take CHEM 351 (4cr) or BIOC 301 and 302 (6cr).
- (3) Students electing a concentration in pre-medicine must take BIOL 111, 151, 263, 331 and a 300-level BIOL elective.
- (4) Intermediate-level foreign language may be included as Liberal Studies elective.

- (1) Complementary field programs have been established for the following areas: Art, Business and Economics, Geoscience, Math and Computing, Physics and Material Science, Philosophy, Pre-Medical and Public Policy. Programs in other areas are also possible – they must include a minimum of 15cr, with at least 6cr at or above the 300-level, and be approved by the advisor and department chair.
- (2) Program contains one writing-intensive course (CHEM 343), students need to acquire another W-course in Liberal Studies, or as a free 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)

Existing courses new to the program:

CHEM 111 – General Chemistry I

CHEM 112 – General Chemistry II

BIOC 301 – Fundamentals of Biochemistry

BIOL 111 – Principles of Biology I

MATH 171 – Linear Algebra

MATH 216 – Probability and Statistics for Natural Science

MATH 241 – Differential Equations

Deleted courses

CHEM 321 – Quantitative Analysis

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 10/9/12)

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

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. **Strengthening of the B.A.** – The B.A. has fewer requirements, but offers more flexibility, than the B.S. degree in chemistry. The department feels that this program has been somewhat under-utilized in the past, and to address this problem, the requirements will be slightly upgraded, and the complementary field programs that give this degree program its flexibility are now better defined. It is the hope that an emphasis on the inter-disciplinary nature of this degree might attract some additional students to chemistry.
2. **Changes to physical chemistry math requirements** – The American Chemical Society Committee on Professional Training requires “foundation” courses in the five fundamental areas (analytical, biochemistry, inorganic, organic and physical) of chemistry. The revision of Physical Chemistry I now requires only MATH 125 and 126, but not 225, as prerequisites. Accordingly, the third required math course is now an option between 225 and three other MATH courses (171, 216 and 241), which will better fit the student’s interests and is more in keeping with the flexibility of the B.A. program.
3. **Importance of Biochemistry to Chemistry** – As the field of Chemistry evolves; the importance of biological applications continues to grow. Therefore, the department now feels that no student can realistically be said to have been educated in chemistry without taking a biochemistry course. BIOL 111 (Principles of Biology I, which gives an introduction to cell and molecular biology) and BIOC 301 (Biochemistry I) will now be required for all chemistry degree tracks.
4. **Need for career guidance in chemistry** – Undergraduate students often learn much about the subject, but their understanding of chemistry as an intellectual pursuit and career choice has not been as well addressed. A new course, CHEM 290, will meet this need by presenting career information to the students and displaying the breadth of chemistry through short presentations by professors in chemistry and other scientific fields.
5. **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 actually 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.A. 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 the combined chemistry department proposals 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 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?

It is hoped that the proposed revision of the BA degree program will result in a small additional number of chemistry majors. However, there is no reason to believe that this increase (if it materializes) will be so large as to require any additional sections of required courses.

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. While the B.A. in Chemistry is not an ACS-certified program, it shares all its chemistry courses with the ACS-certified B.S. degree, so recommendations to that program will also be used to help assess the quality of the B.A. degree program.

Part V. Course Proposals (already approved)

CHEM 214 – Intermediate Inorganic Chemistry

CHEM 231 – Organic Chemistry I

CHEM 232 – Organic Chemistry II

CHEM 290 – Chemistry Seminar I

Part VI. Letters of Support or Acknowledgement

Ron: Thank you very much for sharing this information. As a Biochemistry Coordinator I discussed this request with faculty members Jon Southard and Jenna Villemain, who have taught BIOC 301 and BIOC 302 and are slated to teach in the future. The two concurred with the request. I also fully support the proposed program changes-- Thanks.

N. Bharathan PhD

Professor of Biology
Coordinator Biochemistry

Hello, Ron.

On behalf of the Philosophy Department, let me express unqualified support for your CHEM major/PHIL concentration field program proposal. We should have no difficulty providing needed seats and a suitable course rotation, and we are delighted by the prospect. I hope your new proposals are a great success.

- Mary MacLeod
Associate Professor
Philosophy, Chair

Hello Ron,

I fully support Chemistry department's curriculum revision for developing formal "complementary fields" for your BA degree.

Best regards
Devki Talwar
Chair, Physics

Dear Dr. See,

I am writing in support of your proposed use of Studio Art as a complementary field to your BA degree in Chemistry.

There are several areas within studio art which involve a great deal of chemical knowledge. One example would be Ceramics, with its outcomes based upon successful understanding of the chemical makeup of glazes and their reactions during firing. The other would be Metals, which can involve the application of patinas and various other chemical reactive processes to achieve the desired outcome on the finished piece.

Additional areas use traditional photographic processes and materials, welding, casting and other chemical processes in order to successfully create visual art. In many instances it can involve the understanding of the chemical and/or physical impact of heat upon a material.

Studio Art would complement Chemistry also as a means to spark the creative mind, which will be called upon during scientific or inventive processes.

Andrew Gillham
Chair, Department of Art

Hi Ron:

I have reviewed your program; the Department of Management will be glad to support your program.

Ramesh Soni

Chair, Management

Hi Ron,

Sorry it has taken me awhile to respond.

I think this is a great idea and actually one I have been meaning to promote to several departments. An understanding of the policy process is crucial for many kinds of fields and I am very pleased that Chemistry is taking the initiative.

The specific courses mentioned are good picks. I do not often schedule PLSC 376 Public Sector Budgeting and Financial Management but I can begin to do so again. As I'm sure you know, the courses you have selected constitute a Minor in Political Science so your students will have something concrete in this regard to have on their resumes.

In case it is not clear, I heartily endorse your proposal.

John F. Sitton

Chair of Political Science

Hi Ron,

PLSC 300 is a methods course and PLSC 354 is Metropolitan Problems (urban politics) so I don't think either would help with a basic understanding of how policy is formulated. Instead of those two I would suggest PLSC 351 Legislative Process, PLSC 371 Issues in Public Administration, and PLSC 376 Public Sector Budgeting. The first two are taught at least once a year and I will increase offerings of PLSC 376. How does that sound?

John Sitton

Ron,

We looked over the proposed "complementary fields" program that you list for Geoscience and see no problem with the courses you list. In addition, I'd suggest that you might consider adding GEOS 312 (Hydrogeology) as a possible additional course offering (maybe choose either Geochemistry or Hydrogeology?).

Dr. Steven A. Hovan
Chair, IUP Geoscience Dept.

Thank you, Ron. The choices provided for a "Pre-Med complementary field" look good. I think it will serve such students well.

I'll share this with the rest of the department as food for thought.

Martha Jack
Biology Pre-medical coordinator

Dear Ron,

I write to support your proposed revision to the "complementary field" requirements in Chemistry. I believe your students will be well served by taking the proposed set of courses in mathematics and computer science.

As you and your colleagues move forward I would like to remind you of the frequency the proposed mathematics courses are offered:

Course

MATH 225	Every semester
MATH/COSC 250	Every spring
MATH 241	Every fall semester
MATH 342	Every spring semester

Thanks,

Dr. Francisco Alarcon
Professor and Chair, Mathematics

Additionally, 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