LSC Use Only Proposal No:	UWUCC Use Only Proposal No: 12-866	
LSC Action-Date: App-2/21/13	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

*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 __X__ Program Revision ____ Program Title Change ____ New Track

____ New Degree Program ____ New Minor Program __X__ Liberal Studies Requirement Changes ____ Other

Current program name: Bachelor of Science – Chemistry, Pre-Medical Track

*Proposed program name, if changing:*_____

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)		4/12/12
Department Chairperson(s)	Dan R Yeus	4/12/12
College Curriculum Committee Chair	Anno Kondo	4/20/12
College Dean		2/13/13
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	Gail S Sechrist	3/12/13

Received
FEB 14 2013
Liberal Studies

Part II. Description of Curriculum Change

Bachelor of Science – Chemistry, Pre-Medical Track

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 **Philosophy or Religious Studies:** PHIL 222 **Social Science:** PSYC 101, SOC 151 **Liberal Studies Elective:** 3cr, MATH 126, no courses with CHEM prefix		**44**
Major: **Required Courses:**		**46-47**
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
CHEM 390	Chemistry Seminar II	1
CHEM 490	Chemistry Seminar III	1
CHEM 498	Problems in Chemistry	2
BIOC 301	Foundations of Biochemistry	3
BIOC 302	Advanced Biochemistry	3
Controlled Electives:		
Two of the following: CHEM 326, 342 and 344, or 411		7-8
Other Requirements:		**19-20**
MATH 216	Probability and Statistics for Sciences	3
MATH 225	Calculus III for Physics, Chemistry, and Mathematics	3
BIOL 111	Principles of Biology I	4
BIOL 241	General Microbiology	3
At least 6cr from the following list: BIOL 150, 151, 263, 363, 364 (1)		6-7
Free Electives:		**9-11**
Total Degree Requirements:		**120**

(1)

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 Pre-Medical Track					
Liberal Studies: **Mathematics:** MATH 125 **Natural Sciences:** PHYS 131-141 & 132-142 **Liberal Studies Elective:** 4cr, MATH 126		44	**Liberal Studies:** **Mathematics:** MATH 125 **Natural Sciences:** PHYS 111-121 & 112-122 or 131-141 & 132-142 **Philosophy or Religious Studies:** PHIL 222 **Social Science:** PSYC 101, SOC 151 **Liberal Studies Elective:** 3cr, MATH 126		44
Required Courses		45	**Required Courses**		46-47
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 341	Physical Chem I	4	CHEM 341	Physical Chem I	4
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 410	Adv. Inorganic Chem Lab	1			
CHEM 411	Adv. Inorganic Chem	2	CHEM 490	Chemistry Seminar III	1
CHEM 498	Problems in Chem	2	CHEM 498	Problems in Chem	2
			BIOC 301	Foundations of Biochemistry	3
			BIOC 302	Advanced Biochemistry	3
Controlled Electives			**Controlled Electives**		
additional chemistry elective from the following: CHEM 331, 335, 421, 441, 481		3	Two of the following: CHEM 326, 342 and 344, 411		7-8
Other Requirements		**23-28**	**Other Requirements**		**19-20**
BIOC 301	Biochemistry I	3			
BIOL 111	Principles of Biology I	4	BIOL 111	Principles of Biology I	4
BIOL151	Human Physiology	4	BIOL 241	General Microbiology	3
BIOL 263	Genetics	3	at least 6cr from the list: BIOL 150, 151, 263, 363, 364		6-7
BIOL 331	Animal Devel. Biology	3			
MATH 225	Calculus III	3	MATH 225	Calculus III	3
	Foreign Language	0-4	MATH 216	Prob. & Stat.	3
One of the following: MATH 171, 216, 241 or 342		3-4			
Free Electives		**3-8**	**Free Electives**		**9-11**
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) CHEM 351 may be substituted for BIOC 301.

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

BIOC 302 – Advanced Biochemistry

BIOL 150 – Human Anatomy

BIOL 241 – General Microbiology

BIOL 363 – Medical Microbiology

BIOL 364 – Immunology

PHIL 222 – Ethics

PSYC 101 – Introduction to Psychology

SOC 151 – Principles of Sociology

Deleted courses

CHEM 301 – Introduction to Research

CHEM 321 – Quantitative Analysis

CHEM 322 – Instrumental Analysis

CHEM 410 – Advanced Inorganic Lab

BIOL 331 – Animal Developmental Biology

MATH 171 – Linear Algebra

MATH 241 – Differential Equations

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 overall of the analytical course offerings, and the revision of the inorganic and physical chemistry courses, are proposed in response to the ACS requirements. Additionally, the changes the ACS has instituted allow a variety of programs to their requirements. This flexibility has enabled us to structure a program better tailored to the needs of these Pre-Medical students while increasing the number of free electives.
2. Changes to Pre-Medical preparation – After assessing the requirements and first-year courses of several medical schools in the region, a curriculum that is strong in both chemistry and medical preparatory courses has been devised. This includes some flexibility in the required BIOL courses, to better fit the interests of the students. The program also now includes courses outside the physical/natural sciences, such as ethics (PHIL 222) and behavioral science (PSYC 101 and SOC 151).
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 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 Pre-medical 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 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

Hi Ron,

Let me give the proposed revision some thought before I reply. This is a timely question, in light of the changes to the MCAT (for 2015) and proposed changes to the current, typical medical school curriculum. Right off the bat, though, I can agree with listing PSYC 101 as a required

L.S. social science ---- I have recommended that for the revised Biology Pre-Med track since Psychology has gained increased emphasis for both the MCAT and for med. school curricula. Also, I agree with Ethics as the best choice for the Phil/Religious studies, but as yet I haven't recommended that it be the required selection for Pre-Med students. My reasoning? These students are "boxed in" so much as it is, that I don't want to limit their L.S. choices too severely; it could impact their ability to build a schedule with their science classes that don't have many sections/times to choose from.

Thanks,

Martha Jack

Biology Pre-medical coordinator

Hi Ron,

Note Vida's reply below to my question about BIOL 241 vs. 250 as serving the prerequisite requirement for Medical Micro and Immunology. And as I am very familiar with both Micro courses, my opinion is that even as a stand-alone course (without taking the upper-level 363 or 364), BIOL 241 is more useful for the Pre-Med students, since that course is much more medically oriented; she goes through all the major pathogens for every human organ system, yet still covers microbial metabolism & genetics, plus viruses, viral replication, etc.

The additional Biochem is a very good idea. You already received my reply regarding the Psychology, Sociology, and Ethics. Looks like a lot of thought was put into the track revision, with good results.

Regards,

Martha Jack

Hi Martha,

I have taught both BIOL 363 and BIOL 364 and I have found that students who have taken BIOL 241 are better prepared for both the Med Micro (because I cover Med Micro in 241) or Immuno (same reason) compared to the BIOL 250 students. Having taken CHEM 232 is helpful because students who have passed that are more studious; but it has nothing to do with being prepared for Immuno.

Hope this answers your query.

Regards, Vida Irani.

Hello, Ron.

I support your proposal to make PHIL 222 a required LS Core course for CHEM Pre-Med majors. The Philosophy Department offers at least six sections of PHIL 222 annually, usually more, and there is no reason to think we'd be unable to meet your projected need. Wishing you a speedy curricular approval process!

Mary MacLeod

Philosophy, Chair

Dear Dr. See,

The Psychology Department will be very pleased to accomodate pre-medical track students in General Psychology. If it would benefit these students to enroll in a single section, please let me know. We will then set aside seats for them.

Ray Pavloski

Chair, Psychology

Ron,

The Sociology Department is very supportive of this requirement. Thank you for letting us know.

Alex Heckert

Chair, Sociology

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

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

Appendix A
B.S. – Chemistry Pre-Medical Track
Suggested Sequence

1st Semester		cr		2nd Semester		cr
CHEM 113	Concepts in Chemistry I	4		CHEM 114	Concepts in Chemistry II	4
MATH 125	Calculus I	3		MATH 126	Calculus II	3
BIOL 111	Principles of Biology I	4			Fine Arts	3
ENGL 101	College Writing	3		LS History (HIST 196, 197 or 198)		3
				PSYC 101	Intro to Psychology	3
		14				**16**
3rd Semester				**4th Semester**		
CHEM 231	Organic Chemistry I	4		CHEM 232	Organic Chemistry II	4
MATH 225	Calculus III	3		CHEM 290	Chemistry Seminar I	1
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		BIOL 241	General Microbiology	3
				ENGL 202	Research Writing	3
		14				**15**
5th Semester				**6th Semester**		
BIOC 301	Found. of Biochemistry	3		BIOC 302	Advanced Biochemistry	3
CHEM 341	Physical Chemistry I	4		CHEM 214	Inter. Inorganic Chemistry	3
CHEM 343	Physical Chem I Lab	1		CHEM 498	Problems in Chemistry	1
CHEM 390	Chemistry Seminar II	1		MATH 216	Prob. & Statistics	3
HPED 143	Health & Wellness	3			BIOL elective	3
PHIL 222	Ethics	3		SOC 151	Intro to Sociology	3
		15				**16**
7th Semester				**8th Semester**		
CHEM 325	Analytical Chemistry I	4		CHEM 326 and/or 342 and 344 or free elective		3-8
CHEM 498	Problems in Chemistry	1		CHEM 490	Chemistry Seminar III	1
CHEM 411 or free elective		3			Social Science course	3
	BIOL elective	3			Free Electives	4-9
	Free Elective	3				
		14				**16**