

LSC Use Only Proposal No:
LSC Action-Date:

UWUCC Use Only Proposal No: 12-100
UWUCC Action-Date: AP-3/12/13 Senate Action Date: App-3/26/13

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person(s) Anne Kondo	Email Address akondo@iup.edu
Proposing Department/Unit Chemistry	Phone 74595

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: CHEM 100 Preparatory Chemistry

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)

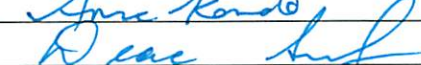
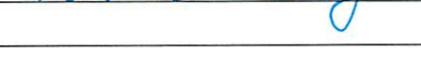
4. Program Proposals

☐ Catalog Description Change ☐ Program Revision ☐ Program Title Change ☐ New Track

☐ New Degree Program ☐ New Minor Program ☐ Liberal Studies Requirement Changes ☐ Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)		2/11/13
Department Chairperson(s)		2/12/13
College Curriculum Committee Chair		3/5/13
College Dean		3/5/13
Director of Liberal Studies (as needed)		
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs		3/13/13

Received

MAR 13 2013

Liberal Studies

Received

MAR 6 2013

Liberal Studies

SYLLABUS OF RECORD – CHEM 100

I. CATALOG DESCRIPTION

CHEM 100 Preparatory Chemistry

(3c-0l-3cr)

Discussion of the fundamental terminology, calculations and concepts of chemistry, including scientific measurements and calculations, simple definitions and concepts, atomic structure, the mole, mass and solution stoichiometry, ionic and covalent bonding, and the naming of atoms, molecules, ions. Intended to prepare science majors with limited backgrounds in chemistry for freshman chemistry courses, and may not be used towards any major or minor or Liberal Studies. Restricted to students in the Colleges of Natural Sciences and Mathematics, and Health and Human Services. Students who have earned a “C” or better in a higher number CHEM course may not take this course.

II. COURSE OBJECTIVES

Students will be able to

1. Convert between common units of measurement used in the study of chemistry, including units such as grams, centimeters, milliliters, liters, moles, molarity, degrees Celsius and Kelvin.
2. Describe the subatomic structure of the elements.
3. Use the periodic table to identify elements, atomic numbers, atomic masses, chemical and physical properties of main group elements and predict common charges on ions.
4. Write formulas and names of ionic and molecular compounds, and calculate molar masses.
5. Write balanced chemical equations and convert between masses and moles using molar masses. Predict quantities of products and left-over reactants after reaction.
6. Define and be able to use “molarity” for studies of solutions, and understand how chemicals behave in solution.
7. Explain the fundamental difference between ionic and covalent bonding.

III. DETAILED COURSE OUTLINE

Preparatory Chemistry is a lecture-based preparatory course for university students with limited background in chemistry

Hours are academic hours

The topics are:

1. How to study chemistry 1 hr
Strategies for students to acquire the appropriate language and skills to master chemistry

2.	<u>Measurements in chemistry</u> Units of measurement, conversion between units, significant figures.	3 hr
3.	<u>Description of Matter</u> Atoms, protons, neutrons, electrons, symbols, chemical formulas, chemical equations. Names and symbols of common elements. Atomic mass scale. Periodic table of the elements.	6 hr
4.	<u>Ionic vs. Molecular Compounds</u> Writing chemical formulas and naming ionic compounds and molecular compounds. Charges on main group ions, common polyatomic ions.	5 hr
5.	<u>Chemical Calculations</u> The mole concept. Molar mass. Converting between mass and moles.	5 hr
6.	<u>Balanced Chemical Reactions and Stoichiometry</u> Balancing chemical reactions; using balanced chemical reactions to convert from mass or moles of one compound to mass or moles of another compound; limiting reagent, percent yield.	5 hr
7.	<u>Reactions in Aqueous Solution</u> Electrolytes, acids, bases, salts. Types of reactions.	5 hr
8.	<u>Solution Stoichiometry</u> Molarity, conversions between volume and moles, dilutions, titration calculations.	4 hr
9.	<u>Ionic and Covalent Bonding</u> Comparison of ionic and covalent bonding.	3 hr
10.	<u>Applications of Chemistry</u> Capstone study of specific applications of the chemistry using previously discussed concepts to ensure understanding.	3 hr
	In-class exams	2 hr
	Total	42 hr
	Final Exam – during exam week	2 hr

IV. EVALUATION METHODS

30 % - two in-class exams will consist of multiple choice, short answer and problem solving questions.

40 % - the final exam will consist of multiple choice, short answer and problem solving questions.

30 % - assignments and quizzes

V. GRADING SCALE

Grading Scale: A: $\geq 90\%$ B: 80-89% C: 70-79% D: 60-69% F: $< 60\%$

VI. ATTENDANCE POLICY

The attendance policy will follow the Undergraduate Course Attendance Policy in the Undergraduate Catalog.

VII. REQUIRED TEXTBOOK(S)

Seager, S.L., Slabaugh, M.R., Introductory Chemistry for Today, 8th edition, Books-Cole, 2013.

VIII. SPECIAL RESOURCE REQUIREMENTS

Students are expected to have their own scientific calculators.

Students are encouraged to use supplementary materials such as books of exercises and occasionally articles in non-specialized journals. There are a number of computer-based programs and web sites that provide drill-and-practice on such topics as chemical nomenclature, balancing chemical reactions, calculation of pH, etc. Students should make sure that they have access to a computer in order to take advantage of these study aids.

IX. BIBLIOGRAPHY

Supplemental bibliography may include journals such as *Journal of Chemical Education*, *Journal of College Science Teaching*, *Science*, *Scientific American*, and *Discover*.

Bauer, R., Birk, J., Introduction to Chemistry, 2nd edition, McGraw Hill, 2010.

Cracolice, M.S., Basics of Introductory Chemistry with Math Review, 2nd edition, Brooks- Cole, 2010.

Goldberg, D.E. ,Fundamentals of Chemistry, 5th edition, McGraw Hill, 2007.

Hein, M., Foundations of College Chemistry, 13th Edition, J Wiley, 2010.

Zumdahl,S.S., DeCoste, D.J., Basic Chemistry, 7th edition, Brooks-Cole, 2011.

Course Analysis Questionnaire

Section A: Details of the Course

- A1 How does this course fit into the programs of the department? For what students is the course designed? (majors, students in other majors, liberal studies). Explain why this content cannot be incorporated into an existing course.

This course is intended for students who have not had any chemistry in high school, or who are underprepared for freshmen chemistry courses for science majors. High failure rates in General Chemistry I (CHEM 111) indicate the need for this course. Although there is some content overlap with CHEM 111, the pace of that course seems to be beyond the ability of the un- or underprepared student. Students who fail CHEM 111 will be encouraged to take CHEM 100 before repeating CHEM 111; students who earn a "D" in CHEM 111 will also be encouraged to take this course before continuing onto General Chemistry II, CHEM 112. Our studies show that students who earn a "D" in CHEM 111 are 50% likely to earn a "D" or "F" in CHEM 112. Unlike most other freshman chemistry classes, there will be no lab component to this course. This course cannot be taken for credit towards any degree or minor, as it is intended to prepare students for the level of learning expect in our college-level chemistry classes.

- A2 Does this course require changes in the content of existing courses or requirements for a program? If catalog descriptions of other courses or department programs must be changed as a result of the adoption of this course, please submit as separate proposals all other changes in courses and/or program requirements.

This course does not require changes to the content of existing courses or requirements.

- A3 Has this course ever been offered at IUP on a trial basis (e.g. as a special topic) If so, explain the details of the offering (semester/year and number of students).

This course has not been offered on a trial basis.

- A4 Is this course to be a dual-level course? If so, please note that the graduate approval occurs after the undergraduate.

This course is not a dual level course.

- A5 If this course may be taken for variable credit, what criteria will be used to relate the credits to the learning experience of each student? Who will make this determination and by what procedures?

This course may not be taken for variable credit.

- A6 Do other higher education institutions currently offer this course? If so, please list examples (institution, course title).

A number of higher education institutions have begun to implement a preparatory chemistry class in response to un- or underprepared students.

University of Pittsburgh, CHEM 0100, Preparation General Chemistry (*This course is designed for those students who intend to take Chemistry 0110 and 0120, but whose science and mathematical backgrounds are judged by their advisors to be relatively weak. The course emphasizes stoichiometry (chemical calculations), chemical equations, gas laws, elementary atomic structure and periodic properties of elements.*)

Kutztown University CHM 001 - Preparatory Chemistry

This course is intended to prepare students for success in General Chemistry I (CHM

100). Although the topic of this course is chemistry, special emphasis is placed on developing strategies that will enable students to apply mathematical techniques, logical thinking, conceptual understanding and problem solving in all areas of science. Enrollment in this course is limited to science and science education majors who have not taken or who have not successfully completed General Chemistry I.

Drexel University – CHEM 050 – Preparatory Chemistry This online course covered general chemical principles, such as stoichiometry, atomic and molecular structure, and characterization of chemical reactions.

Temple University Chemistry 1027 Applications of Chemistry (4 sh)

This course is a transition semester of chemistry to be taken before Chemistry 1031 (C071) designed for students who have not had enough preparation in chemistry or mathematics to directly take Chemistry 1031 (C071). Mathematical concepts and chemical principles will be integrated into a series of common applications. In this class, students will learn proper handling of laboratory materials and perform experiments that are integrated with, as well as introduce and reinforce, the material from the lecture. This course is intended to prepare students for General Chemistry by emphasizing the mathematical basis of chemistry and laboratory measurements. A quantitative introduction to atomic and molecular structure, states of matter, basic thermodynamics, solutions, gas laws, kinetics, and equilibrium.

- A7 Is the content, or are the skills, of the proposed course recommended or required by a professional society, accrediting authority, law or other external agency? If so, please provide documentation.

The content or skills are not required by a professional society, accrediting authority, law or other external agency.

Section B: Interdisciplinary Implications

- B1 Will this course be taught by instructors from more than one department? If so, explain the teaching plan, its rationale, and how the team will adhere to the syllabus of record.

This course will be taught by faculty in the department of chemistry.

- B2 What is the relationship between the content of this course and the content of courses offered by other departments? Summarize your discussions (with other departments) concerning the proposed changes and indicate how any conflicts have been resolved. Please attach relevant memoranda from these departments that clarify their attitudes toward the proposed change(s).

The content does not overlap with the content of courses in other departments.

- B3 Will this course be cross-listed with other departments? If so, please summarize the department representatives' discussions concerning the course and indicate how consistency will be maintained across departments.

This course will not be cross-listed.

Section C: Implementation

- C1 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. What will be taught less frequently or in fewer sections to make this possible? Please specify how preparation and equated workload will be assigned for this course.

Faculty resources will be adjusted to accommodate this additional course in the schedule. Currently, we offer four to five lecture sections and 16-20 lab sections of General Chemistry I (CHEM 111) every fall. Typically, 25 % – 40% of the students registered will fail or withdraw from CHEM 111. Underprepared students may take CHEM 100, but would not have to. We hope to stream (through advising) these students into CHEM 100 in the Fall semester to better prepare them for CHEM 111 the following year. Spring offerings of CHEM 100 will catch students who earned a D or F in CHEM 111. This plan is expected to reduce the number of lab sections needed for CHEM 111/112, and reduce the cost of offering lab to students who are unlikely to successfully complete the course.

- C2 What other resources will be needed to teach this course and how adequate are the current resources? If not adequate, what plans exist for achieving adequacy? Reply in terms of the following:
No additional space, equipment, laboratory, library or travel funds will be required for this course. Current faculty teaching loads will be reallocated to accommodate this course in the schedule.
- C3 Are any of the resources for this course funded by a grant? If so, what provisions have been made to continue support for this course once the grant has expired? (Attach letters of support from Dean, Provost, etc.)
This course is not funded by a grant.
- C4 How frequently do you expect this course to be offered? Is this course particularly designed for or restricted to certain seasonal semesters?
This course will be offered once or twice per academic year, as needed and as resources permit.
- C5 How many sections of this course do you anticipate offering in any single semester?
One section of this course will be offered each spring and fall, if resources permit.
- C6 How many students do you plan to accommodate in a section of this course? What is the justification for this planned number of students?
The size of the classroom will determine the lecture size, although a smaller number of students would aid in more individualized instruction.
- C7 Does any professional society recommend enrollment limits or parameters for a course of this nature? If they do, please quote from the appropriate documents.
To the best of our knowledge, a professional society does not recommend enrollment limits.
- C8 If this course is a distance education course, see the Implementation of Distance Education Agreement and the Undergraduate Distance Education Review Form in Appendix D and respond to the questions listed.
This course is not a distance education course, although the possibility will be explored in the near future.

Section D: Miscellaneous

Include any additional information valuable to those reviewing this new course proposal.
N/A