

LSC Use Only

Number: _____
Action: _____
Date: _____

UWUCC Use Only

Number: 91-48
Action: _____
Date: _____

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. Title/Author of Change

Course/Program Title: SC 102 Fundamentals of Chemistry
Suggested 20 Character Course Title: Fundamentals of Chem
Department: Chemistry
Contact Person: Dr. Frank Fazio

II. If a course, is it being Proposed for:

Course Revision/Approval Only
 Course Revision/Approval and Liberal Studies Approval
 Liberal Studies Approval Only (course previously has been approved by the University Senate)

III. Approvals

John C. Woolson 11/7/91 [Signature] 11/7/91
Department Curriculum Committee Department Chairperson
A. Kaniasty 12/17/91 [Signature]
College Curriculum Committee College Dean *

Director of Liberal Studies
(where applicable)

Provost (where applicable)

*College Dean must consult with Provost before approving curriculum changes. Approval by College Dean indicates that the proposed change is consistent with long range planning documents, that all requests for resources made as part of the proposal can be met, and that the proposal has the support of the university administration.

IV. Timetable

Date Submitted
to LSC: _____
to UWUCC: _____

Semester to be
implemented: _____

Date to be
published
in Catalog: _____

LIBERAL STUDIES COURSE APPROVAL FORM INSTRUCTION SHEET

Use this form only if you wish to have a course included in a Liberal Studies Learning Skill or Knowledge Area category. Do not use this form for synthesis or writing-intensive sections; different forms are available for these. If you have questions, contact the Liberal Studies Office, 352 Sutton Hall, telephone 357-5715.

This form is intended to assist you in developing your course to meet IUP's Criteria for Liberal Studies and to arrange your proposal in a standard order for consideration by the Liberal Studies Committee (LSC) and the University-wide Undergraduate Curriculum Committee (UWUCC). When you have finished, your proposal will have these parts:

- ✓ Standard UWUCC Course Proposal Cover Sheet, with signatures (one page)
- ✓ Completed copy of LS General Information Check-List--Parts 1-3 of this form. (one page)
- ✓ One sheet of paper for your answers to the four questions in Part IV of this form. (one page)
- ✓ Completed check-list for each curriculum category in which your course is to be listed--e.g. Non-Western Cultures, Fine Arts, etc. (one page each)
- ✓ Course Syllabus in UWUCC Format.

Note: If this is a new course or a course revision not previously approved by the University Senate, you will also need a catalog description on a separate sheet and answers to the UWUCC Course Analysis Questionnaire. These are not considered by the LSC but will be forwarded to the UWUCC along with the rest of the proposal after the LSC completes its review. For information on UWUCC procedures, see the UWUCC Curriculum Handbook.

SUBMIT ONE (1) COPY OF THE COMPLETED PROPOSAL TO THE LIBERAL STUDIES OFFICE (352 SUTTON HALL). The Liberal Studies Committee will make its own copies from your original; the committee does reserve the right to return excessively long proposals for editing before they are duplicated. (If you happen to have extra copies of the proposal, you are invited to send multiple copies to the LSC to save unnecessary copying.)

PLEASE NUMBER ALL PAGES.

LIBERAL STUDIES COURSE APPROVAL. PARTS 1-3: GENERAL INFORMATION CHECK-LIST

I. Please indicate the LS category(ies) for which you are applying:

LEARNING SKILLS:

- First Composition Course
- Mathematics

- Second Composition Course

KNOWLEDGE AREAS:

- Humanities: History
- Humanities: Philos/Rel Studies
- Humanities: Literature
- Natural Sci: Laboratory
- Natural Sci: Non-laboratory

- Fine Arts
- Social Sciences
- Non-Western Cultures
- Health & Wellness
- Liberal Studies Elective

II. Please use check marks to indicate which LS goals are primary, secondary, incidental, or not applicable. When you meet with the LSC to discuss the course, you may be asked to explain how these will be achieved.

Prim Sec Incid N/A

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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A. Intellectual Skills and Modes of Thinking:

1. Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process.
2. Literacy—writing, reading, speaking, listening.
3. Understanding numerical data.
4. Historical consciousness.
5. Scientific Inquiry.
6. Values (Ethical mode of thinking or application of ethical perception).
7. Aesthetic mode of thinking.

B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person

C. Understanding the Physical Nature of Human Beings

D. Collateral Skills:

1. Use of the library.
2. Use of computing technology.

III. The LS criteria indicate six ways that courses should contribute to students' abilities. Please check all that apply. When you meet with the LSC, you may be asked to explain your check marks.

- 1. Confront the major ethical issues which pertain to the subject matter, realize that although "suspended judgment" is a necessity of intellectual inquiry, one cannot live forever in suspension; and make ethical choices and take responsibility for them.
- 2. Define and analyze problems, frame questions, evaluate available solutions and make choices.
- 3. Communicate knowledge and exchange ideas by various forms of expression, in most cases writing and speaking.
- 4. Recognize creativity and engage in creative thinking.
- 5. Continue learning even after the completion of their formal education.
- 6. Recognize relationships between what is being studied and current issues, thoughts, institutions, and/or events.

Liberal Studies Course Approval Parts 4-6

- IV. A. The course is multiple -section, multiple - instructor. A coordinator has been appointed by the chairman to ensure a basic equivalency and adherence to the syllabus.
- B. The syllabus objectives lists that references will be made to women and minorities. The textbook mentions three women Nobel Prize winning chemists, Madame Curie, Irene Curie Joliot, and Gerty Theresa Cori. The two journals that the students will be reading from have women as Editors. Laurie Hays is Editor of the Journal of Chemecology and Gayle Ater is associate editor of Wonder Science, an ACS sponsored activities book written specifically for elementary science students and teachers.
- C. Since elementary education majors are involved in the course the references listed in the bibliography are geared to their interest and applications to their major field. (ie: Wonder Science) The students are required ten readings summarized on 4 by 6 cards. Some students may wish to use these references for their lab presentations.
- D. This is an introductory course in chemistry for non-science majors. The content in the syllabus as well as the required textbook is written at an introductory level. It differs from SC 106 in the emphasis that is placed upon making the content and activities in the lab program relevant for the elementary education majors.

CHECK LIST — NATURAL SCIENCES (Laboratory)

Knowledge Area Criteria which the course must meet:

- Treat concepts, themes and events in sufficient depth to enable students to appreciate the complexity, history and current implications of what is being studied; and not be merely cursory coverage of lists of topics.
- Suggest the major intellectual questions/problems which interest practitioners of a discipline and explore critically the important theories and principles presented by the discipline.
- Allow students to understand and apply the methods of inquiry and vocabulary commonly used in the discipline.
- Encourage students to use and enhance, wherever possible, the composition and mathematics skills built in the Skill Areas of Liberal Studies.

Natural Science Criteria which the course must meet:

- Examine a body of knowledge of natural science that will contribute to an understanding of the natural world.
- Provide an understanding of the development of natural science theories and their modification.
- Teach students to formulate and test hypotheses. (Some of the lab exercises demonstrate this)
- Provide an understanding of some of the "great moments" in the history of natural science and the individuals, including women and minorities, responsible for them.

Natural Science Laboratory Criteria which the course must meet:

- Provide students with opportunities to learn and apply data-gathering techniques.
- Provide students with opportunities to develop skills in making accurate observations, in formulating concise and appropriate descriptions of natural phenomena, and in producing meaningful systems of classification for natural objects.
- Provide students with opportunities to apply theories to practice in the working world of science.

Additional Natural Science Criteria which the course should meet:

- Encourage an appreciation of the complex interrelationship of natural science with the life of the individual.
- Develop in students the abilities necessary to cope with the consequences of natural science in the modern world.
- Develop an inquiring attitude consistent with the tenets of natural sciences, an attitude that is willing to expose fallacy on the basis of reason, that demands evidence for scientific assertions, and yet is tolerant of hypotheses in the absence of contradictory evidence.

COURSE SYLLABUS

I. CATALOG DESCRIPTION

SC 102 Fundamentals of Chemistry

2.5 credits
2 Lecture hrs.
2 Lab hrs.

2c-21-2.5 s.h.

Prerequisites: Instructor Permission

A survey of chemical principles and concepts. The nature of chemical reactions as applied to technology and its applications to society. The world of consumer chemistry will be explored. The goal is to develop a chemical literacy for the student. A series of laboratory exercises that develop concept understanding and process skills. Some individual and group projects will be included.

II. COURSE OBJECTIVES

1. To develop an understanding of the role of chemistry in describing our natural environment.
2. To be able to explain in chemical terms, the classification of matter, changes in matter, and resulting energy changes.
3. To develop an understanding of atomic theories and to relate the structure and bonding of atoms and molecules to applications in chemical technology.
4. To be able to use the Periodic Table of Elements.
5. To develop a physical and chemical understanding of the properties of water and to explore some of the problems of water pollution.
6. To develop an appreciation of the history of chemistry, the men, women, and minorities responsible for the contributions.
7. To be able to explain in chemical and other scientific terms, the societal problems of air pollution and the scarcity of energy resources.
8. To provide an understanding of chemistry related to some common consumer products.
9. To provide the necessary laboratory experiences to illustrate the concepts and applications of chemistry and to provide some experiences for making generalizations based upon lab data.
10. To be able to use basic mathematics and some graphical techniques to arrive at quantitative answers to chemical problems.

III. COURSE OUTLINE (26 lectures)

1. Chemistry: Its Nature, Its Technology and the Impact on Society (1 lecture)
2. Atoms as Building Blocks of Matter (3 lectures)
 1. Atomic Structure
 2. Periodic Table
3. Chemical Bonding (3 lectures)
 1. Major Bond Types
 2. Relationship of Structure and Bonding to Properties
 3. Formula Writing
4. Principles of Chemical Reactivity (3 lectures)
 1. Chemical Reaction Types
 2. Balancing Equations
 3. Mole Concept
 4. Thermochemistry
5. Acid-Base Chemistry and Oxidation-Reduction (2 lectures)
 1. Relationship of Acid-Base Chemistry to Environmental Problems
 2. Relationship of Acid-Base Chemistry to Consumer Products
 3. Redox Reactions
6. Nuclear Reactions (2 lectures)
 1. Radioactivity
 2. Fission and Fusion
 3. Role of Nuclear Energy
7. Carbon Chemistry (3 lectures)
 1. Introduction to Hydrocarbons
 2. Organic Chemicals for Society
8. Nutrients and Additives in Food (2 lectures)
 1. Major Types of Vitamins, Nutrients and Minerals
 2. Food Additives: Uses and Safety
9. Toxic Substances (2 lectures)
 1. Corrosive Poisons
 2. Metabolic Poisons
 3. Heavy Metals
 4. Carcinogens and Teratogens
10. Air and Water Pollution Problems (3 lectures)
 1. Major Air Pollutants
 2. Major Water Pollutants
 3. Global Effects of Greenhouse Gases
 4. Global Effects of Ozone Depletion
11. Energy Resources Past, Present and Future (2 lectures)
 1. Fossil Fuels and New Technology
 2. Nuclear Alternatives
 3. Future Energy Options

IV. **LABORATORY PROGRAM** (2 hr./week)

- A. Inquiry Activities, "Candle", "Black Box"
- B. Direct Observations - Physical and Chemical Changes
- C. Paper Chromatography of Magic Markers
- D. Percent Oxygen in Air
- E. Analysis Cigarette Smoke
- F. A Comparison of the Acid Strengths of Common Vinegars
- G. Determination of Water Hardness
- H. Identification of Food Additives in Common Foods
(Actual Labels and References will be used)
- I. Computer Simulation Using Energy Software
(2-3 Apple II Computers necessary)
- J. Student Demonstration and Presentation Activities
(Students will work in groups of 2-4)
- K. Student Demonstration and Presentation Activities
(Students will work in groups of 2-4)
- L. Student Demonstration and Presentation Activities
(Students will work in groups of 2-4)

V. **EVALUATION METHODS**

The final grade for the course will be determined as follows:

50%	Tests	2 tests and 1 final exam at assigned time
15%	Quizzes	3 quizzes during lecture
10%	Written Summaries	10 written summaries based upon 10 articles from popular science journals
25%	Lab	The lab work activities will be averaged together to determine the lab score

VI. **REQUIRED TEXTBOOK**

Textbook: Joesten et. al., World of Chemistry, Saunders Publishing Co., Philadelphia, 1990

Lab Manual: Paperback handouts given in lab

VII. BIBLIOGRAPHY

Ballas, Frank et. al., 1990, Physical Science with Environmental and Consumer Applications, 4th edition, Kendall Hunt Pub. (Dubuque IA), 80 p.

DeVito, Alfred and Gerald H. Krockover, 1976, Creative Science, Little Brown & Co. (Boston) 258 p.

Eby, Denise and Roger Tatum, 1978, The Chemistry of Food Additives, United Graphics, Inc. (Seattle WA), 60 p.

Hill, J.W., 1991, Chemistry for Changing Times, 6th edition, Macmillan Pub. Co. (NY), 624 p.

Miller, G.T. and David G. Lygre, 1991, Chemistry, A Contemporary Approach, 3rd edition, Wadsworth Inc. (Belmont, CA), 674 p.

Selinger, Ben, 1989, Chemistry in the Market Place, Harcourt, Brace, Jovanovich (San Diego, CA), 670 p.

Ucko, David A., 1977, Experiments for Living Chemistry, Academic Press (NY), 190 p.

JOURNALS:

Chem Ecology - 1990

Journal of Chemical Education - 1990

Wonder Science - 1991

Science and Children - 1990

COURSE ANALYSIS QUESTIONNAIRE

SECTION A: Details of the Course

- A1: This course is ideally designed for Elementary Education majors to fulfill their Liberal Studies science requirement and to satisfy recommended national standards for science preparation of teachers in training. This course is proposed as a Liberal Studies science lab course.
- A2: No. This course does not require changes in the content of existing courses.
- A3: This course is traditional in format of a lecture and a lab, but it is non-traditional in that the students have less time in lecture and a 2 hour lab. The course credit is only 2.5 credits.
- A4: No
- A5: No
- A6: No
- A7: Other SSHE colleges do not offer a course like this. This course is designed to fulfill the National Association and to prepare the students for PA Department of Education recommended science competencies. This course is one of the four 2.5 credit courses that elementary education students will take to fulfill the Liberal Studies science lab requirement.
- A8: The content and the lab skills of this course are required by the PA Department of Education (PDE). The chemistry content and the laboratory experiences are not incorporated in any existing course for the Elementary Education majors. The course is part of the four course sequence leading to a total of 10 credits lab science and covering all the PDE recommended competencies.

SECTION B: Interdisciplinary Implications

- B1: This course will be taught by one instructor.
- B2: No
- B3: The content and the lab experiences of this course do not overlap with courses from other departments. The content and lab is similar to the content in SC 106 but the ancillary materials and the lab application experiences are designed to satisfy the needs of elementary education majors.
- B4: No

SECTION C: Implementation

- C1: The course may need close to two full-time faculty prepared to teach this course. The lab space, equipment, supplies are all adequate. The library materials are excellent. No travel funds are necessary.
- C2: No
- C3: This course will be offered every semester. This course may be offered in the summer.

- C4: The typical semester offering will include two lecture sections and six lab sections.
- C5: It is expected that 72-75 students in a lecture and 24 students in each lab section.
- C6: No
- C7: This course will be part of the curriculum requirement of a four-part science sequence for elementary education majors. Please refer to the new requirements of the Department of Professional Studies in Education.

SECTION D: Miscellaneous

This course was developed through consultation with Biology, Physics, Geoscience and Professional Studies in Education. It is strongly recommended that the four courses listed below be evaluated together as a unit.

- SC 101 Physics
- SC 102 Chemistry
- SC 103 Earth and Space Science
- SC 104 Environmental Biology

COURSE SYLLABUS

10

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