

APPLICATION FOR NEW COURSE

1. Submitted by College of Arts and Science Date 3/28/06

Department/Division offering course Chemistry

2. Proposed designation and Bulletin description of this course

a. Prefix and Number CHE 113 b. Title* Laboratory to Accompany General Chemistry II

*NOTE: If the title is longer than 24 characters (including spaces), write
A sensible title (not exceeding 24 characters) for use on transcripts Gen Chem Lab II

c. Lecture/Discussion hours per week 1 d. Laboratory hours per week 2

e. Studio hours per week 0 f. Credits 2

g. Course description

A laboratory course, to accompany CHE 107, emphasizing qualitative and quantitative chemical analysis.

h. Prerequisites (if any)

Prereq: CHE 111; Prereq or Concurrent: CHE 107

i. May be repeated to a maximum of _____ (if applicable)

4. To be cross-listed as

_____ Prefix and Number _____ Signature, Chairman, cross-listing department

5. Effective Date Spring 2007 (semester and year)

6. Course to be offered Fall Spring Summer

7. Will the course be offered each year? Yes No
(Explain if not annually)

8. Why is this course needed?

The current CHE 115 3-credit course will be split into two lab classes (CHE111 and 113) so the laboratory can be offered to first-semester students. The split pair of courses, 111 and 113, will be equivalent to CHE 115 to minimize problems with USP and College degree requirements.

9. a. By whom will the course be taught? Graduate student Teaching Assistants with the direction of the Laboratory Supervisor for General Chemistry and the Director of General Chemistry

b. Are facilities for teaching the course now available? Yes No
If not, what plans have been made for providing them?

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10. What enrollment may be reasonably anticipated? 750

11. Will this course serve students in the Department primarily? Yes No

Will it be of service to a significant number of students outside the Department?
If so, explain. Yes No

General College Chemistry is a service course for a large number of students in many degree programs.

Will the course serve as a University Studies Program course? Yes No

If yes, under what Area? Area VI. Natural Sciences

12. Check the category most applicable to this course

traditional; offered in corresponding departments elsewhere;

relatively new, now being widely established

not yet to be found in many (or any) other universities

13. Is this course applicable to the requirements for at least one degree or certificate at the University of Kentucky? Yes No

14. Is this course part of a proposed new program:
If yes, which? Yes No

15. Will adding this course change the degree requirements in one or more programs? *
If yes, explain the change(s) below Yes No

Currently CHE 115 (General Chemistry Laboratory) is a 3-credit laboratory/recitation course that accompanies the second-semester CHE 107 lecture course. Our two proposals divide CHE 115 into two parts: CHE 111, a 1-credit laboratory allied with CHE 105 and a two-credit recitation/laboratory course in the spring (CHE 113) to accompany CHE 107.

These two courses will be equivalent to CHE 115. The programs that require CHE115 would thus use the two-lab sequence to replace CHE 115 for their majors. Additionally, this equivalence will facilitate subsequent adjustments in USP and College requirements.

16. Attach a list of the major teaching objectives of the proposed course and outline and/or reference list to be used.

17. If the course is a 100-200 level course, please submit evidence (e.g., correspondence) that the Community College System has been consulted.

18. Within the Department, who should be contacted for further information about the proposed course?

Name Dr. Kim Woodrum, Director of General Chemistry Phone Extension 7-7081

*NOTE: Approval of this course will constitute approval of the program change unless other program modifications are proposed.

APPLICATION FOR NEW COURSE

Signatures of Approval:

Sharon M. J. [Signature]
Department Chair

3/31/06

Date

[Signature]
Dean of the College

4/14/06

Date

Sharon Diez
*Undergraduate Council

4/5/06

Date of Notice to the Faculty

10-10-06

Date

*University Studies

Date

*Graduate Council

Date

*Academic Council for the Medical Center

Date

*Senate Council (Chair)

Date of Notice to University Senate

*If applicable, as provided by the Rules of the University Senate

ACTION OTHER THAN APPROVAL

CHE113 Laboratory to Accompany CHE107

16. MAJOR TEACHING OBJECTIVES

- Students will learn to use basic equipment that is available in most chemistry laboratories in a safe manner.
- Students will learn to handle chemicals safely.
- Students will conduct experiments that reinforce topics covered in CHE 107 lecture. These topics include:
 - Chemical Kinetics
 - Acid/Base Chemistry and Buffers
 - Solubility Equilibria
 - Electrochemistry
 - Transition Metal Chemistry
- Students will collect experimental data and perform calculations on these data to reinforce their understanding of the meaning and limitations of the values obtained.
- Students will develop the skills necessary to successfully write a laboratory report. During the course of the semester the students will continue to learn to organize reports in a standard format that includes the following sections:
 - Introduction
 - Data Tables
 - Calculations
 - Results
 - Discussion
 - Error Analysis
 - Conclusions

LEARNING OUTCOMES

On completion of this course, the successful student will have learned the following skills and/or be able to perform the following operations with a reasonable degree of facility.

- To use common laboratory equipment and chemicals in a safe manner
- To make measurements accurately using a variety of laboratory devices and equipment, and to record the data obtained in an organized and systematic manner
- To perform appropriate calculations based on the data collected in the laboratory
- To understand the concept of experimental error and determine possible sources of error in various experimental procedures
- To relate the theoretical concepts learned in lecture to laboratory experiments
- To continue to develop the skills necessary to successfully write a concise and coherent laboratory report

UNIVERSITY OF KENTUCKY
Department of Chemistry

SYLLABUS

GENERAL CHEMISTRY II - LABORATORY

CHE 113

Textbook: *General Chemistry Laboratory Manual, 11th Edition*, Hayden McNeil Publishing, 2004.

Any general chemistry textbook

Calculator: One of the following: TI-73, 82, 83, 83 Plus, 86, 89, 92, 92 Plus (see note below)

Instructor: Dr. Allison Soult
Email: soult@uky.edu

Office: CP-19 Phone: 257-7067
Office Hours:

TA:
E-mail:
Office:
Office Hours:
Phone:

Date(s)	Experiment	Report Due
	Syllabus and Graphing Review	
	Check In and Safety Video	
	SYLLABUS QUIZ ON BLACKBOARD DUE @ MIDNIGHT	
	Make-up Lab Session (contact Dr. Soult for time)	
	1 - Solubility	
	SAFETY QUIZ ON BLACKBOARD DUE @ MIDNIGHT	
	2 - Colligative Properties	
	**PRE-LAB QUIZ 1 ON BLACKBOARD DUE @ MIDNIGHT	
	3 - Kinetics	
	**PRE-LAB QUIZ 2 ON BLACKBOARD DUE @ MIDNIGHT	
	4 - Acids and Bases, pH Buffers	
	* Make-up Lab	
	**PRE-LAB QUIZ 3 ON BLACKBOARD DUE @ MIDNIGHT	
	5 - Le Chatelier & Common Ion Effect	
	**PRE-LAB QUIZ 4 ON BLACKBOARD DUE @ MIDNIGHT	
	6 - Thermodynamics	
	**PRE-LAB QUIZ 5 ON BLACKBOARD DUE @ MIDNIGHT	
	7 - Electrochemistry	
	* Make-up Lab	
	**PRE-LAB QUIZ 6 ON BLACKBOARD DUE @ MIDNIGHT	

8 - Coordination Compounds
****PRE-LAB QUIZ 7 ON BLACKBOARD DUE @
MIDNIGHT**

9 - Nuclear Chemistry
* Make-up Lab
*****LAB NOTEBOOK DUE AT THE END OF THE
LAB PERIOD**

Check Out
**FINAL EXAM(X:XX pm) Safety and Experiments
1 - 9**

Note about Calculators - If you do not yet have a graphing calculator, I recommend the TI-83 Plus Silver Edition or the TI-83 Plus. If you have a TI-83 Plus Silver Edition calculator, you must have OS 1.15 or greater. Press 2nd "MEM" and choose "1:About". The version is just below the calculator model name. If you need to update it, go to <http://education.ti.com/us/product/apps/83p/83pos.html> for more information.

* Only those students who have missed a lab session and have an excused absence are required to attend a make-up lab session. Make-up lab sessions will be held in CP-008

** Pre-lab quizzes will be over the experiments that you will do that week

*** Lab notebooks will be due at the end of the lab period. For this experiment only, students should keep the duplicate copy of their data for use in writing their lab report.

IMPORTANT DATES

Last day to add a class

Last to day to drop a course without a "W" grade

Last day to withdraw from a course

MAJOR RELIGIOUS HOLIDAYS

Students are responsible for notifying the Lab Supervisor, Dr. Allison Soult (CP-19) in writing of anticipated absences due to their observance of such holidays. If such absence occurs on the day of an exam, you must also notify the General Chemistry secretary, Ms. Geri Gerke (CP-125). Notification must be received no later than the last day for adding a class (January 21).

STUDENTS WITH DISABILITIES

Any student with a certified disability should provide this information to the Lab Supervisor, Dr. Allison Soult (CP-19) and the General Chemistry secretary, Ms. Geri Gerke (CP-125) no later than the last day for adding a class (January 21).

INFORMATION CARD (FOR GC-1.1)

All students shall complete and return to the instructor the information card provided. This satisfies University Senate rules regarding intent to attend this course. Failure to submit this card within the first two class periods shall be cause for removal from the class roll.

COURSE PRE- OR CO-REQUISITE

You must have credit for CHE 107 or be currently taking CHE 107 to take CHE 113. If you drop CHE 107, you must withdraw from CHE 113. Any special circumstances must be approved by the Director of General Chemistry (Dr. Woodrum) AND the Laboratory Supervisor (Dr. Soult).

SAFETY

Safety in the laboratory is the number one concern. All students are required to wear safety goggles at ALL times while in the lab and follow all safety rules in the lab. Safety goggles will be provided for students in their lab drawer, but students may purchase and wear other acceptable safety glasses or goggles if they so choose. If these rules are not followed and/or safety goggles are not worn, instructors have the right to ask the student to leave the lab. Students will be given one warning for not wearing goggles, after which they will be penalized 10 points from the lab grade. After three warnings for not wearing goggles during the lab period, students will be asked to leave the lab and be given a zero for that lab report. Students are required to wear long pants or skirts and closed-toe shoes during the lab session. You will NOT be allowed to complete an experiment if you do not wear appropriate clothing. If you have time, you may go change and return to the lab, but you will not be given extra time at the end of the lab period. There are NO make-up labs for failure to adhere to safety rules and policies.

Students are required to pass a safety quiz (see schedule for dates) in order to continue with the course. The material covered in the quiz is from the lab manual (pages 1-9) and the additional safety material covered during the safety lecture and video. The safety quiz score will be one of the lab quiz grades, but it may not be dropped. The safety quiz is available on Blackboard until the date listed on the schedule. Students may take the quiz as many times as they wish prior to the due date listed on the schedule, but must score 75% or better on this quiz and only the last submitted score will count. Failure to submit the quiz will result in you being locked out of that quiz. Those who fail the quiz or do not have a recorded score will be required to complete an additional assignment (instructions will be given) and will not be allowed to work in the laboratory until this requirement is met. Students should continue to come to the lecture so that they will be prepared to do the experiments when they are allowed to return to lab. Students will be allowed to make-up experiments missed due to failing the safety quiz. They can schedule a make-up lab by filling out the Make-up Lab Request Form (available from Dr. Soult in CP-19).

LECTURE

There is a 50-minute discussion period once a week before the lab. During this period, the theory and calculations for that week's experiments will be discussed. Attendance to this lecture period is mandatory in order to participate in that week's experiments. Important safety and experiment information is given during this time, so be on time and stay throughout the whole period.

LABORATORY

There is one lab session each week for this course which meet for 1 hour and 50 minutes each session. Some experiments take longer than others, therefore you should arrive on time and be prepared when coming to the lab session so that you can complete the experiment in the time allotted. Students will not be allowed to stay late in order to complete their experiment.

GRADING

There are several components that will make up your grade for the course including pre-lab quizzes, lab notebook, lab reports, and exams. Grades for the course will be assigned on the following basis: A (90.0-100), B (80.0-89.9), C (70.0-79.9), D (60.0-69.9), E (at or below 59.9).

The grade for the course will be calculated as follows:

Pre-lab Quizzes	15%
Lab Reports	50%
Midterm Exam	15%
Final Exam	20%
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Total	100%

Students are required to check-out of their lab drawer at the end of the semester and replace any broken and/ or missing equipment. Students who do not check-out will receive a grade of I (incomplete). A grade change will not be submitted until check-out is complete and any missing and/or broken equipment is replaced.

PRE-LAB QUIZZES

There will be pre-lab quizzes administered on Blackboard (see page 8 of syllabus for log-in information). The quizzes will be over the experiments that we are going to do in the upcoming week. Questions over safety information and general lab information may be included on any quiz.

- You will have three chances to take the quiz (versions A, B, and C). Only the highest of these three scores will count towards your grade for the course.
- Quizzes will be available for several days prior to their due date so there will be no make-up quizzes. If you will be out of town for any reason, including University approved events, you should complete the quiz prior to leaving if you will not have internet access while you are out of town.
- Answer all questions and press “Submit”. Failure to hit “Submit” will lock you out and you will be unable to take that quiz. If you get locked out of **ALL THREE** quizzes, send an email to Dr. Soult soult@uky.edu immediately with your name, section number, and a short explanation of what happened.
- The lowest two quiz scores will be dropped (counting zeroes that you received for missing a quiz for whatever reason, including computer error). Excuses for three or more missed assignments for whatever reason will require legitimate, documented excuses consistent with University policy. Such excuses must be filed with Dr. Soult within ONE week of the quiz due date.
- Due dates for all pre-lab quizzes are listed in the schedule at the beginning of the syllabus.
- If you think your quiz has been graded incorrectly, email Dr. Soult soult@uky.edu and give your name, section number, quiz number (including version A, B, or C), and problem number. If there is an error, you will be given a point although it may not appear in the Blackboard gradebook. Such requests should be filed within one week of the quiz due date.
- If you wait until the last hour to take the quiz, you may experience an inability to log in due to high traffic on your internet service provider. Extensions are not given because of your inability to get on the web site.

LAB NOTEBOOK

You are required to use the lab notebook that was bundled with your lab manual for this course. If you run out of pages or have a used lab manual and no notebook, please contact Dr. Soult in CP-19. A laboratory notebook is a complete record of what you have done in the laboratory. The following information is a general outline of what information should be included in a lab notebook, additional information is found on the Blackboard site for this course.

- The table of contents must be accurate and complete.
- Each experiment should begin on a new page and you should not skip pages.
- You should complete the blue sections at the top and bottom of every page.
- All entries should be made in blue or black ink and errors should be corrected by drawing through the mistake with a single line so that the information is still legible, should it ever be needed.
- All data and observations should be recorded directly into your lab notebook and should be neat and organized, preferably using tables.
- Never use loose sheets of paper or another notebook.
- All numbers should include units.
- Include equipment identification numbers (if applicable) so that any problems with equipment can be fixed.
- Before you come into the lab, you should have filled in the blue section at the top of the page as well as the Introduction (see page 30 of your lab manual for more information). You must have this completed before you start the experiment. The introduction may be written in your lab manual or typed on a separate sheet of paper. If it is handwritten, you will have to type it for your lab report. The TA should initial your introduction before you start the experiment.

- At the end of the lab session, you should sign and have your TA sign the blue section at the bottom of all pages used during the experiment and turn in the duplicate copy to your TA. It is the responsibility of the student to turn in these pages BEFORE leaving the laboratory.
- NEVER remove any original pages from your lab manual. Part of your notebook grade will be based on whether or not all pages are intact.
- Sample calculations can be written in your lab notebook, but will need to be either typed or written neatly on separate paper for your report. For repetitive calculations, you can show one and tabulate answers for the rest. Show units for all numbers.
- Lab notebooks will be turned in at the end of the semester for grading (see schedule for due date).

LAB REPORTS

A lab report must be submitted for each experiment and is generally due at the next regularly scheduled lab session. See schedule for specific due dates for each lab report. Reports are due at the start of the lab period. Any report not handed in by twenty minutes into the lab session will be considered late and will not be accepted. Additional information on writing lab reports can be found in the lab manual on pages 29-32. In case of discrepancies between the lab manual and the syllabus, refer to the syllabus. If you have questions, contact your TA or Dr. Soult.

March 28, 2006

Dr. Leonidas Bachas
College of Arts & Sciences
275 Patterson Office Tower
University of Kentucky
Lexington, KY 40506-0027

Dear Dr. Bachas:

CHE 115 (General Chemistry Laboratory) is a 3-credit laboratory/recitation course which accompanies CHE 107 (General Chemistry II). Currently, the class meets two days per week (two hours each day) in the laboratory and meets one hour per week for recitation. The course is intended for students pursuing careers in the natural sciences, engineering and health professions such as medicine and dentistry.

The attached set of documents supports the request of the Department of Chemistry to institute two new courses that will be equivalent to CHE 115.

- CHE 111 (Laboratory to Accompany General Chemistry I), a 1-credit laboratory that will meet one day per week for two hours.
- CHE 113 (Laboratory to Accompany General Chemistry II), a 2-credit laboratory/recitation that will meet one day per week for two hours in the laboratory and one hour per week in recitation.

These course proposals were initiated as a result of the Department of Chemistry External Review of February 2003 and are supported by a one year trial of the courses as (A&S100) for the 2004-2005 academic school year. During the 2005-2006 academic year we are continuing the trial courses while the application process proceeds.

Rationale for Change

In February 2003, the Department of Chemistry underwent an External Review. The Review Committee highlighted five areas of concern in the Undergraduate Chemistry Program, three of which involved the General Chemistry Program. In order to bring our program in line with our benchmark institutions, the Review Committee recommended that we institute a General Chemistry Laboratory concurrent with the first semester of general chemistry.

Based on this recommendation, the Department of Chemistry applied for and received a Quality Enhancement Program Grant from the Assessment Center at the University of Kentucky. The funding paid for the cost of furnishing the laboratory with the equipment and supplies needed to

make the change and to determine whether the change would indeed have a positive impact on CHE 105 (General Chemistry I) student performance. Students in the experimental courses showed marked improvement in multiple areas as shown in the summary presented in the tables on the following pages. The data clearly support the proposed changes in the General Chemistry laboratory program. Note that the number of students participating in each category in the study is indicated in the tables by the variable *n*. In both CHE 105 and CHE 107, the numbers show a decline in the DEW rate when students participate in the laboratory. Furthermore, there is a significant increase in the number of students receiving A and B's in CHE 105 and CHE 107 when they participate simultaneously in the laboratory. Such participation appears to assist average students to excel in the courses.

Grade Breakdown (CHE105 FALL 2004)

Category (% of grade)	Total CHE105 Students*** (<i>n</i> =1560)	CHE105 Students in Lab (<i>n</i> =70)
Exam 1 (20%)	70%	73%
Exam 2 (20%)	76%	78%
Exam 3 (20%)	68%	71%
Final (25%)	72%	72%*
HW Average (10%)**	68%	77%
Class Participation (5%)**	81%	84%
Average Math ACT	26.01	25.18

Note: Exam 3 and the Final were curved to receive the percentages in the table.

* One student did not take the final examination; therefore *n*=69.

** Section 005 did not require class participation. For this section 15% of grade was based on the homework grade.

*** Grades of students participating in the laboratory were not removed in these calculations. The effect of this action is minimal because *n* is quite large relative to the number of students participating in the laboratory.

Summary of Grade (CHE105 FALL 2004)

Category	All CHE105 Students (<i>n</i> =1560)	CHE105 Students in Lab (<i>n</i> =70)
Total Percentage Points Earned	74.6%	77.1%
GPA for course	2.17	2.32
% A	16.5%	20.8%
% B	20.7%	22.2%
% C	19.0%	15.3%
% D	13.9%	13.9%
% E	12.4%	13.9%
% W	8.8%	5.6%

Grade Breakdown (CHE107 SPRING 2005)

Category (% of grade)	CHE107 /A&S100 (<i>n</i> =38)	CHE107 /CHE115 (<i>n</i> =496)	CHE107/ No Laboratory (<i>n</i> =345)
Exam 1 (20%)	71%	72%	65%
Exam 2 (20%)	70%	71%	63%
Exam 3 (20%)	69%	72%	64%
Final (25%)	67%	71%	63%
HW Average (10%)	77%	78%	60%
Class Participation (5%)	72%	79%	57%

Summary of Grade (CHE107 SPRING 2005)

Category	CHE107 /A&S100	CHE107 /CHE115	CHE107 / No Laboratory
Total Percentage Points Earned	73.3%	75.8%	66.0%
%A	21%	23%	5%
%B	26%	20%	15%
%C	13%	22%	20%
%D	11%	13%	13%
%E	21%	14%	24%
%W	11%	8%	24%

Advantages and Disadvantages

There are a number of advantages to offering these two parallel laboratory courses relative to a single one-semester laboratory course (CHE 115).

- The first and most compelling advantage of the first-semester parallel laboratory is the hands-on experience with chemicals and apparatus by students. Chemistry is broadly defined as *the study of matter and the changes it undergoes*. By denying students direct experience with matter and its changes, we negate one of the primary pedagogical advantages of the laboratory sciences. A first-semester of chemistry with no laboratory becomes a theoretical experience and experimental science is a mere abstraction.
- With the additional attention to the subject provided in the first semester, our data show an increase in student success rate as indicated by the percentage of A, B, and C grades earned in CHE 105. The rather large statistical uncertainty in the data preclude assigning a high level of significance to the results, but the trend is certainly in the direction of higher achievement. Our primary objective is improvement in student learning and success.
- The data for CHE 107 clearly demonstrate that students who enroll in a concurrent laboratory (A&S 100 or CHE 115) perform significantly better than those who are not enrolled in a laboratory. These results are quite significant statistically in spite of the rather large uncertainty of the data.
- Requiring CHE 107 students to enroll in CHE 115 lab in its current 3-credit format represents a heavy load for some students in a single subject during the spring semester of their freshman year. Currently, CHE 115 students perform experiments that reinforce topics covered in *both* CHE 105 and CHE 107 lectures. By dividing the laboratory, there is a more realistic and balanced load placed on students, and the topics covered in the laboratory reinforce concepts covered in the lecture in real time, not after the fact.
- The change will eventually balance out the teaching loads of our graduate assistants. Currently, the vast majority of students enroll in CHE 115 during the spring semester, concurrent with CHE 107. The large number of students causes a serious imbalance in our teaching load. In addition, several of our advanced laboratories are offered in spring semester only, which further exacerbates this problem. By instituting the two-semester CHE 111/CHE 113 laboratory sequence, we will be able to utilize our resources much more effectively by balancing the number of TAs in the fall and spring semesters.

- We anticipate that no additional teaching assistants will be needed except during the period in which the transition is made from the one-semester to the two-semester laboratory.

We believe that the rationale for instituting the two-semester laboratory program in General Chemistry is compelling. Our evidence suggests that this change will improve student learning and performance and that departmental resources will be utilized more efficiently and effectively. We respectfully request that you review and approve the pair of proposals submitted. If you have any questions or need further information, please contact us.

Sincerely,

Kim Woodrum
Director of General Chemistry

Carolyn P. Brock
Director of Undergraduate Studies

/jec