CAMPBELLSVILLE UNIVERSITY

COURSE SYLLABUS

PLEASE TYPE. DATE 14 July 2016

ACADEMIC UNIT Natural Science Division FACULTY Elizabeth K. Sutton

Discipline	Course # Section	Title of Course	Credit Hours	Cross Reference (if applicable)
CHE	453-91	Physical Chemistry I Lab	1	n / a

TEXTBOOK [ ] Required [X] Not Required

Author Halpern, Arthur Title Experimental Physical Chemistry, 3rd ed

Publisher W.H. Freeman Date of Publication 2006

WORKBOOK [ ] Required [ ] Not Required

Author Title

Publisher Date of Publication

PLEASE ANSWER THE FOLLOWING QUESTIONS ON A SEPARATE SHEET OF PAPER AND ATTACH TO THIS FORM.

1. DESCRIPTION OF COURSE: Develop a brief description of the course as it will appear in the Catalog.

2. STUDENT LEARNING OBJECTIVES: List the student learning objectives for the course. Please relate these objectives to the mission and goals of the University and the Academic Unit. For general education courses, please indicate which student learning objectives address general education goals and the intended method of assessment. A minimum of four of the seven general education goals must be included.

Example: Students will demonstrate their ability to compare and contrast two types of basket weaving. (Goal: Oral and Written Communication; Evidence: research paper and class presentation)

3. COURSE OUTLINE: Outline the topics/units that are to be taught.

4. EVALUATION: How do you plan to determine the grade in the course? Please include grading scale.

5. REQUIREMENTS:
   a. Examinations: State when tests are to be administered, including unit, mid-term, and final examinations.
   b. Reports: How many, length required, and what type (Oral, term and/or research, book critiques).
   c. Supplemental reading assignments or outside work required.
   d. Supplemental instruction aids: Audio visual aids, field trips, guest speakers, etc.

6. BOOKLIST

DEAN Date Copy Received

VICE PRESIDENT FOR ACADEMIC AFFAIRS Date Copy Received

I. **TITLE: CHE 453 Physical Chemistry I Laboratory**, one credit hour.

II. **DESCRIPTION OF COURSE:** A laboratory course illustrating the theoretical principles discussed in CHE 451. One 3 hour laboratory period per week is required.

III. **COURSE OBJECTIVES**

A. **General Education Curriculum Objectives (GECO):** (numbered to correspond to the listing in the University catalog)

2. Critical Thinking: Students will demonstrate the ability to reflect on theories and issues in a systematic fashion.
4. Ethics: Students will demonstrate an understanding of Christian values and ethical standards in order to make mature and informed decisions concerning moral issues.
5. Oral and Written Communication: Students will demonstrate the ability to express ideas, beliefs, and information in an organized, precise, and persuasive manner.
6. Quantitative Literacy: Students will demonstrate the ability to understand and utilize mathematical and/or logical relationships to analyze data, to construct and assess arguments, and to make sound judgments in quantitative situations that arise in daily life.
7. Social Responsibility and Citizenship: Students will demonstrate an understanding of personal and social responsibility in a changing global environment so that students can make contributions to their respective discipline and to society as a whole.

B. **Student Learning Outcomes (SLO)**: Students will demonstrate their laboratory skills and problem solving ability in this course. (numbered to correspond to the pertinent General Education Curriculum Objective [GECO])

1. Students will specifically demonstrate laboratory and safety techniques that are related to quantitative analysis of solution chemistry and chemical samples. (GECO 6; Evidence: lab reports)
2. Students will develop skills to critically analyze the validity of experimental data.(GECO 6; Evidence: lab reports)
3. When possible, real life samples will be used to expose students to practical, real-world problem solving of contemporary, historical, technological, and societal issues. (GECO 2, 6, 7; Evidence: lab reports)
4. Students should be able to read, understand, and apply scientific information through thinking more critically, discussing more meaningfully, arguing more persuasively, and writing more effectively. (GECO 2, 5; Evidence: lab reports**)**
5. Students will follow ethical practices when conducting research, writing reports, using sources and when working with others. (GECO 4; Evidence: lab reports)
6. Students will develop an awareness of how a basic understanding of chemistry, the proper application of that knowledge, and the interaction between chemistry and other fields of study and careers is important to personal and social issues. (GECO 4, 6, 7; Evidence: lab reports)

C. **Program Learning Outcomes (PLO):** (numbered to correspond to the program learning outcomes listed in the program assessment document)

2. The student will be able to perform qualitative/quantitative chemical analyses/syntheses through the use of the appropriate laboratory techniques/equipment, experimental design, data acquisition, interpretation of data, and relevant instrumentation.
4. The student will be able to articulate chemical information/data/ideas clearly and effectively in speech and in writing in an acceptable presentation format.
6. The student will demonstrate critical thinking skills in chemistry: interpretation, evaluation, explanation, and scientific inquiry; how to ask appropriate questions, gather relevant

information effectively and creatively, and reason logically from this information to make reliable conclusions**.**

D. **Course Objectives**: Upon completion of this course:
(Numbered to correspond to the pertinent Program Learning Outcome [PLO])

1. The student will learn the practical laboratory techniques involved in measuring the properties of physicochemical systems; gas law relations free energy and equilibria; electrochemical processes; and solutions. (PLO 2; Evidence: lab reports)
2. The student will learn to evaluate the results of your experiments and to present them in a proper scientific format. This will include demonstrating good technical writing skill and appreciation of inherent errors in laboratory experiments. (PLO 4,6; Evidence: lab reports)
3. The student will be able to determine the heat capacity ratio of gases. (PLO 2, 4,6; Evidence: lab reports)
4. The student will be able to measure enthalpies of combustion by use of a bomb calorimeter. (PLO 2, 4,6; Evidence: lab reports)
5. The student will be able to measure enthalpies of reaction in solution by use of a solution calorimeter. (PLO 2, 4,6; Evidence: lab reports)
6. The student will be able to determine the molecular weight of an unknown solute by measuring the freezing point depression of a solution containing the solute. (PLO 2, 4,6; Evidence: lab reports)
7. The student will be able to determine the partial molar volumes of a solution by measuring the density as a function of concentration. (PLO 2, 4,6; Evidence: lab reports)
8. The student will be able to use statistical methods to treat error and use least squares methods to analyze data. (PLO 2, 4,6; Evidence: lab reports)

IV. COURSE OUTLINE

A. Techniques
B. Experiments
   1. Error propagation
   2. Properties of Gases
   3. Thermochemistry
   4. Equilibria
      a. Phase
      b. Chemical
   5. Transport Properties
   6. Kinetics

V. EVALUATION

The student's final grade will be based on the performance of five to ten laboratory experiments and written reports. Laboratory reports: 75% and lab notebook gradings: 25%. A twelve-point scale will be used to compute the final grade. 100-88% = A; 87-76% =B; 75-64% = C; 63-52% = D and 51-0% = F.

Dates to Remember:			
Evening classes begin	Aug 29	Fall Break-No Classes	Oct 20,21
Day classes begin	Aug 30	First Bi-term ends	Oct 22
Last day add /register for Fall term	Sep 2	Second Bi-term begins	Oct 24
Labor Day-No Class	Sep 5	Last day to drop a semester class with W	Nov 18
Last day to drop 1st Bi-term class with W	Oct 7	Thanksgiving Break-No Classes	Nov 23-25
Midterm Week	Oct 17-21	Finals Week	Dec 12-16

VI. COURSE REQUIREMENTS:

A. **Attendance:** Each student is expected to attend at each class meeting. The University Undergraduate Student Attendance Policy will be followed in this course. This class meets once a week; therefore, according to the policy only two (2) absences are allowed. If a student is more than 25 minutes late (by my watch), then that student will be counted as absent.

B. **Numbers to Remember:**
   1. **Campus Security Cell Phone: 270-403-3611**
   2. **Campus Security Office Phone: 270-789-5555**
   3. **Natural Science Division Phone: 270-789-5065**

C. **Safety:** A separate sheet will be passed out that must be read, understood, and signed by each student before participation in the laboratory will be allowed. ***There are no exceptions to the safety rules.*** Violation of any of the rules or any additional precautions for particular experiments relayed by the instructor will result in the student being removed from the lab, and repeated violations will result in a failing grade for the course.

D. **Exams:** There are no exams in this course. The final grade will be based on the performance and write-up of lab experiments.

E. **Lab Reports:** Your reports will consist of three types:

(1) Written Reports: Except for equations, laboratory reports must be double-space typed using a minimum font size of 12 point. Equations (both mathematical and chemical) should be handwritten, unless you are experienced in the use of an equation editor. Reports should contain the sections described below.

a) **Full Reports**

I. Abstract: The abstract (250 words max) should give a summary of the entire experiment: what was measured, experimental method, results with 95% confidence limits, important conclusions. The abstract must be complete in itself, although it is separate from the rest of the paper.

II. Introduction: This section should answer the questions: 1) What is the reason for performing this experiment; 2) What is the theory supporting the experiment; and 3) What is the methodology used? The second point will constitute the major part of the introduction. Give equations unique to the experiment and conditions necessary for the equations to be valid. Identify all variables with their units. Number equations consecutively in the right margin, and refer to the original number if the equation is used again (e.g., in the Sample Calculations). Also include molecular structures for pertinent compounds (other than macromolecules). In writing this section, aim to explain the experiment to a senior-level chemistry student who has taken physical chemistry, but who is otherwise unfamiliar with the procedure or method. Try not to copy the introductory material in the text or handout.

III. Experimental Procedure: The procedure should be clearly explained in paragraph form in sufficient detail that a person trained on the instrument could repeat the experiment. Use the passive voice (no commands). Include the manufacturer and model name/number for each instrument used. Also, be sure to include a reference to the laboratory manual.

IV. Calculations: Give a sample calculation with actual data (including units) to show how results are obtained. Include text as needed to explain what is involved; do not just write out a series of equations.

V. Error Analysis: Include a mathematical analysis of the random errors in the experiment. Include text as needed to explain what is involved; do not just write out a series of equations.

VI. Data and Results: Use a spreadsheet program (e.g. Excel) to prepare graphs, making sure that you obey general rules for graph drawing. Tables should contain all necessary data and results, but not intermediate calculations (i.e., no "spreadsheet dumps"). Also include introductory text to direct the reader to the tables and graphs, to specify experimental parameters (e.g., temperature) held constant throughout the experiment, and to explain symbols, etc. The table summarizing the final results should include available literature values. Guidelines for tables and graphs are given in Young, V.Y. *Laboratory Manual for Introductory Analytical Chemistry,* pp5-8, and in the *ACS Style Guide* available at http://pubs.acs.org/userimages/ContentEditor/1246030496632/chapter14.pdf

VII. Conclusions and Discussion: This is the most important section of the report and should not be taken lightly. Referring to your summary table, evaluate the quality of your results (i.e., Do the error limits for the measured value include the accepted value?). Relate the experimental results to the chemistry of the system (what did you learn from the experiment?). Discuss pertinent sources of error and their effects on the results. If possible, make suggestions for improvements.

VIII. References: Special procedures, literature values, and discussions of previous research results must be referenced in the text using superscript numbers. The references themselves belong in a separate section at the end of the report using the format specified in the "Author Guidelines" download from The ACS Style Guide, 3rd edition: http://pubs.acs.org/page/books/styleguide/index.html. (Note: The laboratory manual should be referenced as shown on the first page of this syllabus.)

b) **Abbreviated Reports**

I. Abstract: Same as full reports.

II. Experimental Procedure: Reference the procedure in the laboratory manual and state any alterations. For each instrument, give the manufacturer's name and model number.

III. Calculations: Give sample calculations using actual data and units. Give an appropriate header for each.

IV. Error Analysis: Show necessary mathematical operations using actual data and units. Give an appropriate header for each.

V. Data and Results; VI. Conclusion and Discussion; VII. References: Same as full reports.

**** It is expected that reports will be neat and written in good English, with proper attention paid to paragraph structure, grammar, spelling, etc. Substandard reports will be rewritten (with appropriate point deductions).

(2) Oral Reports: There will be an oral presentation of one of the experiments (specified by the instructor). Organize your talk to fit a 20-minute time block (typical length at an ACS meeting, etc.) and use transparencies or PowerPoint to facilitate the presentation. You should approach an oral report as a job or graduate school interview and dress accordingly.

F. **Laboratory Notebook***:* Students are required to keep a laboratory notebook detailing the procedures, data, etc., obtained in the lab analyses conducted during the course. The format for the notebook will be discussed in class. The first three pages of the notebook are left blank for your Table of Contents. The notebook pages must be used sequentially in *historical time order*. For example, while preparing for a lab, don't "skip" five or six pages, for example, for that particular experiment. In the laboratory, **all** information, data, calculations, notes, etc. should be recorded directly into this notebook and **not** on scrap paper. *Information written on anything other than the lab notebook pages (notebook paper, paper towels, etc) will be confiscated*.

The lab notebook should be written in blue or black permanent in a clear and concise format. Errors should be crossed out with a single line and the correction written next to it. Don't scribble completely over the error. Your notebook must reflect the absolute truth of your laboratory experience. Each page of your notebook must be dated. **Before you leave the laboratory each time you have done lab work, the instructor must review your work and initial and date your notebook just below where your entries end.**

Before entering the laboratory, the student should become thoroughly familiar with the experiment and prepare the notebook to make record keeping and report writing more convenient. Title, procedure, theory, and tables for data should be prepared prior to the laboratory period. Lab Reports should be typed on the computer and printed before being handed in. Students are encouraged to use the appropriate software to create figures, graphs or chemical drawings to create more professional looking lab report but some hand drawing of figures will be tolerated.

G. **Teaching Methods:** The instructor will demonstrate important laboratory procedures, safety precautions and a review of necessary calculations at the beginning of the lab period. Students will

then proceed to complete the assigned experiment. The instructor will be available to answer questions throughout the lab period.

H. **Classroom Behavior:**

1. Guests are only allowed in class at the discretion of and with prior approval from the instructor.
2. Electronic recording devices of any kind are not permitted except in special circumstances and with the specific permission of the instructor.
3. While you are expected to attend and participate in this class, your cell phone, computer, and MP3 players are **not**. Pagers, cell phones, and similar items are disruptive to the entire class and **must be turned off** during class. **The owner of any such device that activates during class will be immediately excused from class and counted as absent for the entire period.**
4. Use of cell phones, computers, and MP3 players during examinations and quizzes will be considered academic dishonesty, which will result in a zero being awarded for the quiz or examination (No exceptions!).
5. Hats and caps are to be removed prior to entering the classroom.
6. Take care of any physiological needs *before* coming into the classroom.
7. Unacceptable student behaviors:
   a. Sleeping during class
   b. Chronic tardiness. Be here ready to learn when class begins.
   c. Reading, studying or working on materials for other classes.
   d. Chatting with your classmates when the instructor or other classmates are speaking.
   e. Prematurely packing up your books and bags before class has been dismissed.

I. **Academic Misconduct/Integrity:** Students in this course will be working toward mastery of the material to satisfy the course objectives. ***This class is held to an honor system, meaning that cheating, allowing someone to cheat, or failing to report known cases of cheating are all considered academic misconduct***. Cheating includes, but is not limited to, any attempt to present the work of another as your own; discussing or copying exams, quizzes, or homework with students who have not yet completed them; using "cheat sheets" on exams or quizzes; altering a test for re-grade, plagiarism of primary or secondary sources of information or using programmable calculators to store and/or recall prohibited information for an exam. Any student who refuses to allow a calculator to be inspected by the instructor upon request will not be allowed to use that calculator on the exam/quiz. Be aware that aggressive methods are used to protect the majority of you who are honest. Violations will be dealt with according to the University and Divisional policies. A copy of the Division of Natural Sciences (DNS) policy on Academic Integrity will be available on the course TigerNet page. Please read this policy and take it very seriously. For information about plagiarism and how to avoid it, consult the following website: https://www.indiana.edu/~academy/firstPrinciples/. Students will be asked to sign an integrity statement on each examination and quiz. The following statement reads as follows:

"I pledge on my honor that on this assignment/examination/quiz I have neither received nor given nor have I seen any dishonest work.

Signature _____ Date _____"

VII. **Book List**

None. (Handouts for experiments will be available.)

VII. **Disabilities**

Campbellsville University is committed to reasonable accommodations for students who have documented physical and learning disabilities, as well as medical and emotional conditions. If you have a documented disability or condition of this nature, you may be eligible for disability services. Documentation must be from a licensed professional and current in terms of assessment. Please contact the Coordinator of Disability Services at 270-789-5192 to inquire about services.

VIII. **Academic Support**

The Academic Support area, located in the Badgett Academic Support Center (BASC), exists to help students. At certain times, most students need some help with studying, choosing a career, major/minor, or assistance in a difficult course. The following services are available Career Services, Disability Services, tutoring, and the Citizens Bank & Trust Writing Center. *These services are provided at no extra cost to the student.* Space is also available for individual and group study, and laptop computers are available for students to check-out and use within the building. Information about these services is accessible by clicking on the "Current Students" tab on the University website at www.campbellsville.edu. Information is also available by calling the Office of Academic Support at (270) 789-5064.

IX. **TITLE IX**

Campbellsville University and its faculty are committed to assuring a safe and productive environment for all students. In order to meet this commitment and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office of Civil Rights, the University requires all responsible employees, which includes faculty members, to report incidents of sexual misconduct shared by students to the University's Title IX Coordinator.

Title IX Coordinator:
Terry VanMeter
1 University Drive
UPO Box 944
Campbellsville, KY 42718

Administration Office 8A
Phone: 270-789-5016
Email: twvanmeter@campbellsville.edu

Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at: www.campbellsville.edu/titleIX

TENTATIVE SCHEDULE OF EXPERIMENTS

WEEK OF	TOPIC/EXPERIMENT
AUG 29	General Information, Techniques, Safety, Check In; Expt. # 0 Error Analysis
SEPT 5	Expt. #1 Constant Volume of Gas Thermometer
12	Expt. #2 Heat Capacity of Metals
19	Expt. #3 Heat Capacity Ratio of Gases
26	***Lecture Exam #1***
OCT 3	Expt. #4 Reactions & Enthalpy
10	Expt. #6 Phase Diagram of a Binary System
17	Expt. #6 continued
24	***Lecture Exam #2***
31	Expt. #7 Equilibrium & Thermodynamics
NOV 7	Expt. #7 continued
14	***Lecture Exam #3***
21	**THANKSGIVING BREAK--NO LAB**
28	Expt. #8 Kinetics of Phenolphthalein
DEC 5	Expt. #8 continued
12	**Finals Week—NO LAB.**

COURSE #: _____ SEMESTER: _____

COURSE TITLE: _____

Student's Acceptance of Course Policies

Please fill out and sign the following form and **return it no later than _____** to the instructor. **Use a blue or black pen (no pencil).**

I, _____, have read the entire syllabus describing the course
(*Print your name neatly*)

policies for this course, taught by Ms. E. Kay Sutton. I fully understand these policies and I agree to comply with them during the entire _____ term.

Signature: _____ Date: _____