Core Curriculum Course Submission
Criteria: Science

1. General Information

a. Originating Person	b. Contact Person's E-mail	c. Contact Phone	d. Date
Robert Belford	rebelford@ualr.edu	(501)569-8824	04/15/2014

e. College/School	f. Department/Program
College of Arts, Letters, & Sciences	Chemistry

☒ **Submission Statement**
By submitting this form, we acknowledge our understanding that the Core Council has the authority to review approved courses to ensure they continue to meet the established goals and outcomes of that category of the core; that the Council has authority to develop a core assessment program; and that the Council will be developing review and assessment policies by the end of 2014. Further, we agree that if this course is approved, we will participate in the university-wide assessment of the core.

☒ **Chair and Dean Awareness**
Your department chairperson and college dean must be made aware of your submission for core. By submitting this form, you are acknowledging that this has occurred.

2. Course Information

a. Course ID	b. Current Title
CHEM 1402	General Chemistry I

c. Catalog Description

Prerequisite: MATH 1302 or higher level class, with a grade of C or greater. Students must also attain the minimum score on a placement examination to qualify for enrollment in CHEM 1402. Students who do not attain the minimum score may enroll in CHEM 1300. Finishing CHEM 1300 does not substitute for meeting the minimum score on the placement examination. The class builds upon a knowledge foundation in chemistry and offers inquiry into topics of scientific measurement, chemical nomenclature, expressing qualitative and quantitative statements about chemical reactions, qualitative atomic theory, electronic and molecular structure models, chemical periodicity, thermo-chemistry, gases, kinetic molecular theory, and nuclear chemistry. The class is designed for chemistry majors and others needing rigorous instruction. It meets ACTS criteria. Three hour-long lectures and one three-hour laboratory session per week. Four credit hours. (ACTS Course Number CHEM 1414)

d. How will your department ensure a level of consistency among sections of this course? Who will be responsible for this?

This laboratory science course will use a common syllabus for all instructors that will be reviewed by the department's curriculum committee each semester that this course is taught. Any new instructors for this core course will be given a copy of the grid outline submitted to the core council with instructions to make sure that they include it in their course planning. Currently this class is not offered online. As a chemistry laboratory course the department does not plan on offering this class online. Any new faculty teaching this class will be mentored and will use the standard syllabus. Any changes to the syllabus will be reviewed by the chair and department curriculum committee. This course requires a pre-test for entrance into the course to insure that the students have the proper preparation to succeed in CHEM 1402

Educational Goals	Learning Outcomes students will...	Learning Objectives: At the end of the course students will be able to...	Assignments	Explanation
Knowledge 1 – **Concepts, methodologies, findings, and applications of mathematics and the social and natural sciences, engineering and technology.**	1. understand the theoretical perspective used in one or more science discipline;	**Learning Objectives 1.1** identify key concepts and principles in chemistry needed for their basic background knowledge. This includes basic theory involved in chemical bonding, structure, reactions and thermodynamics.	**Assignments 1.1** Reading assignments from the textbook, online supporting material and lectures will provide the content. Student understanding and mastery of these concepts is tested through quizzes and exams.	**Explanation 1.1** Background knowledge in chemistry is required for science majors to integrate the science disciplines.
	2. understand observational and experimental methods used in one or more of the sciences;	**Learning Objectives 1.2** Employ observational and experimental methods used in chemistry to insure safe handling of chemicals and other materials.	**Assignments 1.2** Standardized laboratory experiments cover a wide variety of chemical concepts and stress the importance of safety. Students develop an understanding of basic chemical methods including determining acidity of reactions, measuring gas evolution, performing both qualitative and quantitative determinations of chemical reactions. Students are required to do pre-lab written assignments, and keep copy of their data in lab notebooks. These writing assignments are graded and quizzes and a lab final are also given to evaluate student mastery of these skills.	**Explanation 1.2** Lectures and laboratory assignments are coordinated to stress specific chemical principles and reaction concepts.
	3. understand applications	**Learning Objectives 1.3**	**Assignments 1.3**	**Explanation 1.3**

	and limitations of the sciences;	Identify examples of the limitations of science and correctly use units of measure.	Assignments examine the current knowledge and also stress how this evolved from an historical perspective and how we have improved our knowledge base as time passes. Knowledge must advance to insure sustainable and safe use of chemicals and materials. Reading and lectures as well as laboratory work is used to understand limitations of science. Examples of misuse of units or miscalculations are stressed in both lectures and laboratory pre-labs. Students are asked to give explanations for why some of the labs may have difficulties due to a variety of variables, including laboratory temperature, laboratory technique, equipment limitations, and stress this through accuracy and precision. Past and current sustainablity and environmental issues are discussed in the text and in lecture and labs to note the significant areas where we will need a better understanding of science to overcome some of these pressing issues.	Science students need to recognize that the current status of science, and understanding of chemistry and materials, limits the applications and capabilities in many areas of society. Past and future advances in chemistry lead to a number of current practices as well as future goals for chemistry.
Educational Goals	**Learning Outcomes students will...**	**Learning Objectives: At the end of the course students will be able to...**	**Assignments**	**Explanation**
Skills 1 –	1. develop an understanding	**Learning Objectives 1.1**	**Assignments 1.1**	**Explanation 1.1**

Communication	of how to communicate scientific procedures, results from the inquiry and conclusions resulting from applying the scientific method;	communicate scientific procedures, results from the inquiry and conclusions resulting from applying the scientific method using chemical language which employs formula, equations and graphs.	Laboratories are done as separate student endeavors. Pre-lab assignments are given and graded as part of the students preparation for the laboratory and include organization of thoughts, as well as materials needed for the various experiments. Laboratory data is recorded from their experiments with students performing activities such as graphing dependent/independent variable analysis in order to predict behavior of chemical systems.	An example of a required experiment for all students is the determination of the enthalpy of neutralization for the reaction between hydrochloric acid and sodium hydroxide. This is done by measuring the temperature as a function of time after mixing solutions of known concentration. The resulting molar enthalpy of neutralization is reported in the laboratory notebook.
Educational Goals	**Learning Outcomes students will...**	**Learning Objectives: At the end of the course students will be able to...**	**Assignments**	**Explanation**
Skills 2 – Critical Thinking, Quantitative Reasoning, and Solving Problems Individually and Collaboratively	1. develop basic skills from the scientific method including inquiry, data collection, analysis, and interpretation in order to explore a scientific problem from hypothesis testing to formulating a conclusion based on the inquiry;	**Learning Objectives 2.1** Connect the data collection and experiments with the discussion of theory and hypothesis, and perform experiments individually or as a team.	**Assignments 2.1** Pre-lab assignments, and laboratory experiments are performed for all labs individually, although group work occurs in some labs with respect to data collection.	**Explanation 2.1** The concepts learned in the lab directly lead to a hands-on validation of the hypothesis relating to concepts learned in the lecture.
	2. learn about the world through observation and experimentation, through modeling and interpretation, and through analysis and evaluation;	**Learning Objectives 2.2** Connect the theory and practice of chemistry, correlate the experimental components of the science to the theoretical and provide both a derivation and confirmation of scientific modeling processes.	**Assignments 2.2** Students perform laboratory experiments that are coordinated to match lecture material.	**Explanation 2.2** The hands-on nature of the laboratory assignments allows the student to connect the practical and theoretical components of chemistry.

Educational Goals	Learning Outcomes students will...	Learning Objectives: At the end of the course students will be able to...	Assignments	Explanation
Skills 3 – Information Technology	1. develop and apply technological tools for inquiry, analysis, and presentation of scientific information and data;	**Learning Objectives 3.1** Use graphing calculators, and chemical instrumentation such as balances, thermometers and eudiometers to make measurements relating to the theoretical principles.	**Assignments 3.1** Perform graphing calculations of linear dependent/independent variable relationships that are critical to scientific understanding. One example involves interpolation of the water vapor pressure between obtainable values within a data table and applying that to the analysis of measured pressure values.	**Explanation 3.1** Using calculators students perform complex calculations to determine the value of a dependent variable (vapor pressure) from an independent variable (temperature), and then use that value and the concept of Dalton's law of partial pressure to determine the pressure of hydrogen gas above an aqueous reaction that is in equilibrium with the water vapor pressure, even though they did not directly measure the hydrogen gas pressure (they measured the total pressure).
Educational Goals	**Learning Outcomes students will...**	**Learning Objectives: At the end of the course students will be able to...**	**Assignments**	**Explanation**
Values 1 – Personal Responsibility and Ethical Behavior	1. take responsibility for completing assignments in an ethical manner, working on one's own when required and acknowledging resources when used;	**Learning Objectives 1.1** Differentiate between acceptable and unacceptable use of other's work.	**Assignments 1.1** Students are required to attend lecture and lab and independently complete all coursework. Students are required to pass the mastery-based Indiana University-Bloomington online Plagiarism test https://www.indiana.edu/~istd/. Students are required to attend lab.	**Explanation 1.1** Credit will not be given for work not completed independently. Missing three labs leads to a failing grade in the course.

	2. develop an understanding of the ethical obligations in conducting research, and of being precise and accurate with data, including how this obligation applies to communication of information;	**Learning Objectives 1.2** Use significant figures and percent error to accurately reflect the precision and accuracy of their data.	**Assignments 1.2** Lab reports indicating data and calculations are submitted for seven experiments. Grading rubrics for laboratory reports include points for the correct number of significant digits as well as deductions for percent errors outside the acceptable range.	**Explanation 1.2** In chemical calculations, the correct answer requires more than correct math; it also requires expressing work to all certain and the first uncertain measurement, the correct number of significant digits. Points are lost on lab reports and exams for answers that are mathematically correct, but expressed to the wrong number of significant digits.
Educational Goals	**Learning Outcomes students will...**	**Learning Objectives: At the end of the course students will be able to...**	**Assignments**	**Explanation**
Values 2 – Civic Responsibility	1. develop an understanding of the ethical issues that may result when applying scientific knowledge that is incomplete.	**Learning Objectives 2.1** Evaluate the potential for harm that could result from use of incomplete or inaccurate scientific information.	**Assignments 2.1** Students are presented a case study involving Safety Data Sheets being used to make decisions about the environmental impact of a compound.	**Explanation 2.1** Safety Data Sheets, the standard source of chemical safety information, are produced by the manufacturer and are sometimes incomplete.

Additional Comments:

All sections will use this assignment, regardless of who teaches the lecture.

Belinda Blevins-Knabe — Approved by Core Curriculum Committee

5-14-14 — Date

Approved by Provost

5/23/2014 — Date

Approved by Chancellor

5/28/14 — Date