Honolulu Community College
General Education – DIVERSIFICATION DESIGNATION
Certification and Recertification
Application Form
Spring 2012

APPLICANT: Michael Ferguson

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COURSE ALPHA and NUMBER:  Chem 105

COURSE TITLE:  Environmental Chemistry

ESTIMATED NUMBER OF SECTIONS:
  Fall: 2
  Spring: 0

APPLICATION IS FOR:
  ☐ New Course  ☐ Modified Course  ☐ Existing Course  ☐ Re-designation
  ☐ Certification  ☑ Re-Certification. Date of last certification:

DIVERSIFICATION AREA DESIGNATION SOUGHT:
  ☐ DA (Arts)  x DP (Physical Sciences)
  ☐ DB (Biological Sciences)  ☐ DS (Social Sciences)
  ☐ DH (Humanities)  x DY (Laboratory)
  ☐ DL (Literature and Language)

What percentage of the CONTENT of this course focuses on this diversification area?  90

What percentage of CLASS MEETINGS focuses on this diversification area?  90
1. **Hallmarks and SLOs.** Please explain how course-specific SLOs align with the diversification area’s hallmarks.

Chem 105 is both DP and DY designation. The class is 6 hours per week. Three of those hours are dedicated to lecture and three are dedicated to lab. The following states how the SLOs fit the hallmarks.

Upon successful completion of CHEM 105, the student will be able to:

1. What chemistry is and the scope of the discipline
2. Atomic structure
3. Chemical bonding
4. The different states of matter
5. The risks associated with radiation and the practical uses of nuclear technology
6. Acid and base reactions
7. Oxidation and reduction reactions
8. Carbon-containing compounds (organic chemistry)
9. Polymers
10. Water resources on the Earth and the effects of pollution
11. The atmosphere and the effect of pollution on the atmosphere
12. Our current dependence on fossil fuels and the future of our energy consumption
13. Biochemistry
14. Food and nutrition
15. Agriculture
16. Toxicology
17. Waste disposal
18. Fire chemistry

DY.1 uses the laboratory methods of the biological or physical sciences;

1. What chemistry is and the scope of the discipline
2. Atomic structure
3. Chemical bonding
4. The different states of matter
5. The risks associated with radiation and the practical uses of nuclear technology
6. Acid and base reactions
7. Oxidation and reduction reactions
8. Carbon-containing compounds (organic chemistry)
9. Polymers

All of these SLOs fit with the hallmark due to the use of jargon, terminology, and practical laboratory methods. For SLO 1, chemistry is the study of matter and its changes. Chemistry is explored in the laboratory mostly using wet chemical methods. The use of the glassware and measurement machines such as scales is included in this exploration. SLO 2 is probed by experiments looking at spectroscopy. The basics of spectroscopy are covered by this. SLO 3 fits
into experiments because labs are performed where the states of matter are explored. For instance, iodine is sublimed and then returned back to solid iodine and shown to not undergo a chemical change; whereas, magnesium is reacted to form magnesium oxide where the bonding changes from metallic to ionic. SLO 4 fits this as well because of the phase change just recently written about. SLO 5 is not very closely experimentally covered, but the students do handle some radioactive materials sealed in jars but are able to measure the radiation via a Geiger counter, and notice that not all elements are radioactive and that simple distance or shielding can protect against radiation. For SLO 6, a titration lab is used to determine the amounts of acid in vinegar. Titrations use techniques involving glassware and the use of indicators to determine when there is no longer any acid present. Most chemical reactions are oxidation/reduction reactions, so they often occur in the laboratory, supporting SLO 7 for this hallmark. Magnesium is directly oxidized in a brilliant white flame for one of the experiments. The students look to see how the properties of magnesium oxide are different than magnesium. The students also do a synthesis of soap from fat and lye. In this reaction, they are learning the basics of synthesis, which is covered under this hallmark. Soap is covered in organic chemistry/biochemistry due to the nature of the fat molecules. Also for SLO 9, the students do an experiment classifying plastics. The analysis using the scientific method show the technique behind the sciences.

DY.2 involves processes and issues of design, testing, and measurement;

The experiments noted for SLOs 1-9 do involve design, testing, and measurement. The nature of the experimental techniques in the laboratory require all of those skills. For instance whenever the students use the glassware, scales, or any of the equipment, they are both testing and performing measurements. For laboratory design, the students have a small amount of design every experiment. There is one experiment where the students design the experiment themselves and explore how much carbon dioxide is produced from human respiration. Here, the entire experiment is designed by the students.

DY.3 demonstrates the strengths and limitations of the scientific method.

Part of the limitations in science is in how effective the measurement is in terms of precision and accuracy. Also, error is a part of any experiment. These items all show the strengths and limitations in the application of the scientific method. The entire course involves the use of the scientific method. This lab course uses experiments to reinforce the concepts in the lecture. Included in this are the strengths and limitations of the scientific method. All of the experiments used in exploring SLOs 1-9 fit this hallmark.

DP.1 uses the terminology of the physical sciences;

The scientific method uses specific terms such as hypothesis, theory, and law. The application of those terms to physical science is key in the course. Included with all SLOs is how the scientific method is used in its analysis. All SLOs also require the students to expand their vocabularies to include the terminology of the physical sciences. This jargon uses the terminology of the physical sciences.

DP.2 involves knowledge and theories relating to processes in the physical sciences;

The scientific method is the process behind all sciences, therefore the process of physical science
will be included in all aspects of the course. All SLOs fit this discussion because the scientific method is covered through the whole course. Chemistry includes many basic constructs such as atomic theory. The knowledge of atomic theory and how it was derived shows the processes of the physical sciences. Continuing the example with atomic theory, applications such as mercury pollution and how we can respond to it show that all points are validated in this hallmark. The applied chemistry in the SLOs 2-18 cover this hallmark.

DP.3 demonstrates inquiry that involves observation/experiment and reasoning and mathematics.

Observation and experimentation are part of the scientific method, which is covered through the entire course. This implies that inquiry involving observation and experiment are present. Also, the data are analyzed and conclusions are drawn in the forms of theories and/or scientific laws. This course takes the principles of chemistry and applies it to environmental issues. For instance, acid rain can form from anthropogenic emissions of sulfur oxides. These oxides can react with other atmospheric components like oxygen and water and form sulfuric acid. The sulfuric acid can then damage plant life, streams, and structures. All these steps are covered in class and they include data and how those data are analyzed. Numerous other environmental topics are covered such as mercury in fish. All involve experimental data and how those data are analyzed. Furthermore, there is an experimental aspect of this course. Because of that, the students perform this inquiry directly.

2. **Assessment strategies.** Explain assessment strategies you have used (or plan to use) to measure the degree to which students exit the course with the course-specific SLOs. If there are multiple sections of the course taught by different instructors, please discuss how assessment is (or will be) carried out across instructors.

There is informal feedback in terms of formative assessments during the lecture and summative tests. The informal formative feedback is by a multiple choice question asked during the lecture to see if the students understand the course material. These formative assessments are not graded, but are used to see if the students understand the material. The formative assessments also provide instant feedback to the instructor to see if the students understand the material.

For the laboratory, assessment is completed in terms of formative assessments during the lab and summative laboratory reports. The formative assessment takes place during the laboratory and is used to ensure that safety and sustainability are foremost concerns. Safety and environmental consciousness is important to experimentation. The formative assessment also allows the instructor to dock points if a student is acting unsafely or if the student does something that may cause environmental damage like improper disposal of chemicals.

The summative tests are multiple choice. The test questions are based off of the SLOs, for instance some of the terms in the scientific method are directly tested. There are various types of multiple choice questions that are used in assessment. For instance, some questions simply test knowledge
like in defining the terms in the scientific method. Also, there are questions based off of evaluations to determine if a chemical equation is properly balanced. Also there are various other types of questions like comparative questions between different theories, application type problems for chemistry in the environment, etc.

The laboratory reports assess how well the students understand the experiments and the specific concepts explored in the experiment. The experiments try to run parallel to the lecture course as much as possible. The remaining SLOs are tested directly in the laboratory reports. The methods used involve calculations, analysis of data, comparing different sets of data, and conclusions that a student would draw from those data.

At the end of the term, course evaluations are passed out where the students can assess the course instructor and content. The student evaluations give direct feedback to the course. There is only one instructor teaching this course per term. If there are more than one, then the instructors would meet to make sure the courses are congruent. This would be performed by each section having the same experiments, reports, and rubric for grading both the reports and formative assessments on safety and sustainability.

3. **Assessment of assessment.** How have you used (or plan to use) the assessment findings to modify or improve this course? If there are multiple sections of the course taught by different instructors, please discuss how review of assessment results is (or will be) carried out across instructors.

The assessment questions have changed to reflect more standardized type of questions. This is due to discussions I have had with other faculty at UH Manoa who expressed that these types of questions help prepare students to take more formal tests like the GRE or MCAT. The assessments have shown that the students do leave the course understanding the SLOs. Sometimes students will dish questions after the exams. If the questions are ambiguous, those questions are no longer used.

Assessment of assessment will happen on a semester-by-semester basis as the instructor looks back to the data from students' performance and sees if both the method of instruction needs to be changed or if the type of assessment is truly effective in determining how well the students are tested based off of the SLOs.

There is only one instructor teaching this course per term. If there are more than one, then the instructors would meet to make sure the courses are congruent. This would be performed by similar or same questions in exams to see how the students perform across the board.
DIVERSIFICATION BOARD DECISION:

☑ Approved
Re-Certification Due: 2017

☐ Not approved
If not approved, reasons for disapproval:

Diversification Board Chair Signature:

Date: 5/29/12
Chem 105
Course Outline

Textbook

Chemistry for Changing Times, 12th edition, John W. Hill and Doris Kolb, Pearson, NJ.

General Description of Course

Introductory chemistry course covering basic and applied chemistry necessary for understanding toxicological and environmental effects of chemicals. Coordinated lecture and laboratory activities in basic chemistry, hazardous materials, applied biochemistry, and environmental chemistry.

This course fulfills a physical science and a physical science lab requirement for Honolulu CC for the AA degree, and a DP and DY requirement for UHM

Student Learning Outcomes

Upon successful completion of CHEM 105, the student will be able to:

* What chemistry is and the scope of the discipline
* Atomic structure
* Chemical bonding
* The different states of matter
* The risks associated with radiation and the practical uses of nuclear technology
* Acid and base reactions
* Oxidation and reduction reactions
* Carbon-containing compounds (organic chemistry)
* Polymers
* Water resources on the Earth and the effects of pollution
* The atmosphere and the effect of pollution on the atmosphere
* Our current dependence on fossil fuels and the future of our energy consumption
* Biochemistry
* Food and nutrition
* Agriculture
* Toxicology
* Waste disposal
* Fire chemistry

Please note that the SLO’s are also the course content.

Grading:
The student’s grade in the course will be decided by laboratory exercises and 4 exams. Any types of academic dishonesty including cheating or plagiarism will result in the failure of the course.

Relative weights:

<table>
<thead>
<tr>
<th>Evaluation</th>
<th>Relative weight</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midterm exam (4)</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>Lab exercises</td>
<td></td>
<td>20%</td>
</tr>
</tbody>
</table>

Special note on safety: this is a laboratory course; so safe lab practices must always be in effect. Students participating in unsafe lab practices like improper personal protective equipment or mishandling of chemicals may either be docked 1-5% of the semester grade, be expelled from the lab with no chance of a make up and/or face other sanctions decided by the instructor. Every participant in the lab must have personal protective equipment when chemicals are present in the laboratory. If a student does not have proper personal protective equipment at the start of class he or she will be asked to leave the laboratory. Personal protective equipment includes safety glasses, closed toe shoes, pants (covering the knee) and shirts with sleeves.

Course Grades:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100-90%</td>
</tr>
<tr>
<td>B</td>
<td>89-80%</td>
</tr>
<tr>
<td>C</td>
<td>79-70%</td>
</tr>
<tr>
<td>D</td>
<td>69-60%</td>
</tr>
<tr>
<td>F</td>
<td>Below 60</td>
</tr>
</tbody>
</table>

Curving may be employed if necessary.

Student ACCESS:

Web Site: http://hono.lu.hawaii.edu/disability

Student ACCESS provides coordinated services to help students with documented disabilities achieve their educational goals. Students requiring disability accommodations should submit requests in advance to HCC’s Student ACCESS Office with appropriate disability documentation. For more information visit the Student ACCESS web site or call 844-2392 (voice/text).

Academic Dishonesty:

Academic Dishonesty: Academic dishonesty cannot be condoned by the University. Such dishonesty includes cheating and plagiarism (examples of which are given below), which violate the Student Conduct Code and may result in expulsion from the University.
**Cheating** includes, but is not limited to:
- giving or receiving unauthorized assistance during an examination;
- obtaining unauthorized information about an examination before it is given;
- using inappropriate or unallowable sources of information during an examination;
- falsifying data in experiments and other research;
- altering the record of any grade;
- altering answers after an examination has been submitted;
- falsifying any official University record; or,
- misrepresenting the facts in order to obtain exemptions from course requirements.

**Plagiarism** includes, but is not limited to:
- submitting, in fulfillment of an academic requirement, any document that has been copied in whole or in part from another individual’s work without attributing that borrowed portion to the individual;
- neglecting to identify as a quotation another’s idea and particular phrasing that was not assimilated into the student’s language and style or paraphrasing a passage so that the reader is misled as to the source;
- submitting the same written or oral material in more than one course without obtaining authorization from the instructors involved; or,
- drylabbing, which includes obtaining and using experimental data and laboratory write-ups from other sections of the course or from previous terms, or fabricating data to fit the desired or expected results.

Copies of the Student Conduct Code are available at the HCC Office of the Dean of Student Services.

**Native Hawaiian Values**

An understanding within the course is that the instructor and students will form a community where the following values will be upheld:

**Aloha** – Love, compassion, charity etc.

**Laulima** – To work together, Cooperation. "Many hands make light work"

**Lokahi** – Unity, Harmony, Agreement etc.

**Malama** – To take care of, care for, Preserve, Protect etc.

**Kuleana** – Responsibility, Rights, Privilege etc.

**`Ike** – Knowledge, Awareness and/or Understanding.