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

APPLICANT: JOHN SHEN
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COURSE ALPHA and NUMBER: MICRO 140

COURSE TITLE: GENERAL MICROBIOLOGY LABORATORY

ESTIMATED NUMBER OF SECTIONS:
Fall: 1
Spring: 1

APPLICATION IS FOR:
☐ New Course ☐ Modified Course ☒ Existing Course ☐ Re-designation

☒ Certification ☐ Re-Certification. Date of last certification:

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

What percentage of the CONTENT of this course focuses on this diversification area? 100%

What percentage of CLASS MEETINGS focuses on this diversification area? 100%
Guidelines and explanatory notes for the following questions are located at the end of this document.

1. **Hallmarks and SLOs.** Please explain how course-specific SLOs align with the diversification area’s hallmarks.

<table>
<thead>
<tr>
<th>DY.1 Uses Laboratory Methods of Microbiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLOs #1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 13/14, 15/16, 18, 19</td>
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<thead>
<tr>
<th>DY.2 Uses Processes and Issues of Design, Testing, and Measurement</th>
</tr>
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<tbody>
<tr>
<td>SLOs #5, 8, 10, 13/14, 15/16, 21</td>
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<tr>
<th>DY.3 Demonstrates Strengths and Limits of the Scientific Method</th>
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<tbody>
<tr>
<td>Anytime a given exercise or experiment yields results that are inconsistent with the theoretical results, I always remind the students that we are working with biological specimens and sometimes they do not behave in a consistent manner to coincide with results that are anticipated. Some of the exercises in which this may occur include SLOs #6, 8, 9, 10, 13, 14, 15. This is one explanation that cannot be used in a physics or chemistry laboratory.</td>
</tr>
</tbody>
</table>

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.

   For the past 35 years, I have been the sole instructor for MICRO 140 on this campus. The students are given two 2 Lab Practicals worth 50% of their final grade. Good attendance counts for roughly 25% of their final grade with too many missed labs resulting in a lowering of The final grade that they receive. In addition, there are about 10-12 write-ups that each student must turn in, in which they answer specific questions about the theory behind an upcoming laboratory exercise. In some cases, they are given problems to solve, in which they must demonstrate how they arrive at their results in quantitative lab exercises (SLOs #4, 10, 13/14, 15/16). These write-ups represent about 25% of their final grade. The students are also tested on whether they can identify some of the various algae, fungi, and protozoa which they observe under the microscope.

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.

   Over the years, especially during my first decade here at HCC, I fine-tuned the design of a number of laboratory exercises, invariably driven by the need to simplify the protocols, and also fine-tuned
the nature of the topics for which students had to turn in write-ups, and finally, also modified and adjusted the 2 laboratory practical exams. In a science lab course such as MICRO 140, there is no wholesale modification or elimination of protocols that students may find challenging or feel un-necessary. There is a Laboratory Manual in which almost every lab exercise is laid out, and my job is to adhere to the protocols and methodologies spelled out in the Lab Manual. And again, I am the individual who guarantees that the course contents are consistent year after year on this campus.
DIVERSIFICATION BOARD DECISION:

☑ Approved
Re-Certification Due: Spring 2018

☐ Not approved
If not approved, reasons for disapproval:

Diversification Board Chair Signature: [Signature]
Date: 3/8/13
MICRO 140  GENERAL MICROBIOLOGY LAB

STUDENT LEARNING OUTCOMES

Upon successful completion of MICRO 140, the student will be able to

1. Use the microscope with an oil immersion lens (100X) to focus on bacteria at a total magnification of 1000X.

2. Make wet mount slides for the above observations

3. Identify bacteria from the standpoint of colony morphology and cell morphology.

4. Trace an epidemic back to the index case, a person who begins an epidemic (artificial epidemic created in the lab).

5. Prove the efficacy of alcohol as a disinfectant on the skin.

6. Streak plates of agar and slants of agar with bacteria, and also perform streaks for isolation (of pure cultures of bacteria).

7. Prepare both liquid (broth) media and solid media (nutrient agars) for growing bacteria.

8. Demonstrate the effects of Ultra-Violet radiation on bacterial survival and how variations in the intensity of the UV and the time of exposure can affect their survival.

9. Isolate a pure culture (axenic) of bacteria from any natural source (waters, soil, skin, food, milk).

10. Determine the population of bacteria in a liquid culture (#cells/ml) or solid source (#cells/gm).

11. Identify the presence of bacterial endospores with an endospore stain.

12. Identify bacteria as being Gram + or Gram – using the classic Gram Stain procedure.

13. Determine the effectiveness of many antibiotics (over 20) against both Gram – and Gram + bacteria, and also determine the most effective and least effective ATBs as well as the most resistant and most sensitive bacteria.
15. Determine the effectiveness of many different household and bathroom antiseptics and disinfectants sold OTC at the drugstore (6 different classes based upon mechanisms of action) and determine those that are the most effective and the least.

16. Recognize different types of selected algae under the microscope.

17. Recognize different types of fungi under the microscope.

18. Recognize different types of protozoa under the microscope and learn about some of the more common protozoan diseases that some of them can cause.

20. Understand the nature of viruses and how they damage host cells, resulting in viral diseases as well as learning about the etiology and epidemiology of some common viral diseases.

21. Appreciate the nature of Prps (Prion proteins) and their role in causing TSEs, transmissible spongiform encephalopathies.
MICRO 140 SYLLABUS AND LAB SCHEDULE

In this Microbiology Lab course the student will be introduced to some of the very basic techniques intrinsic to all Microbiology Labs, including the use of oil immersion microscopy for viewing bacteria, different methods of streaking bacteria onto agar plates and slants, how to determine the population of bacteria in any natural sample of material (water, air, soil), the Gram stain used for identifying bacteria and establishing the type of cell wall that they possess, and the endospore stain used to identify endospore producing bacteria. In addition, the student will learn to identify enteric bacteria by their growth patterns on differential and selective media, technique used in all bacteriology labs worldwide.

There will also be experiments designed to illustrate the effects of different temperatures on the survival of bacteria, the effects of ultraviolet radiation on the survival of bacteria and the effects of many different antibiotics and antiseptics and disinfectants (common everyday ones found at any pharmacy) on the survival or resistance of different types of bacteria.

Then there will be several labs designed to illustrate the metabolic and physiological activities of bacteria such as exo-enzyme production, carbohydrate fermentation, nitrate reduction and urea hydrolysis.

The student will also learn to identify different types of algae, fungi (with emphasis on fungal morphology), and protozoa (with emphasis on pathogenic protozoans). Finally, there will be an exercise demonstrating the presence and power of the enzyme, lysozyme, in human tears.

<table>
<thead>
<tr>
<th>EXERCISE</th>
<th>WORKBOOK MODULE</th>
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<tbody>
<tr>
<td>Introduction to the class</td>
<td></td>
</tr>
<tr>
<td>Prepping a Wet Mount</td>
<td>4, 5</td>
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<tr>
<td>Oil Immersion Microscopy</td>
<td></td>
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<tr>
<td>Media Prep and Sterilization (Demos)</td>
<td>2, 3</td>
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<tr>
<td>Ubiquity of m/os</td>
<td>6</td>
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<tr>
<td>Loop inoculation of agar</td>
<td>7, 10, 12</td>
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<tr>
<td>Streak for Isolation</td>
<td></td>
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<tr>
<td>Making a smear and Gram Stain</td>
<td>21, 23</td>
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<tr>
<td>Artificial Epidemic &amp; Epidemiology</td>
<td>Handout</td>
</tr>
<tr>
<td>Quantitative Determination of Bacterial Populations (Serial Dilution Pour plate technique)</td>
<td>8, 9, 41, 42</td>
</tr>
<tr>
<td>Repeat</td>
<td></td>
</tr>
</tbody>
</table>
Effects of Temperature on Survival and Growth of Bacteria 29

Effects of UV radiation on Survival 30

Capsule Stain 24
Endospore Stain (age dependency for sporulation) 25

Effects of Antibiotics (ATBs) 32
MECHANISMS OF ACTION OF ATBs Textbook

Effects of Antiseptics & Disinfectants 31
MECHANISMS OF ACTION Textbook

LAB EXAM I

Use of Selective and Differential Media to Identify Enteric Bacteria (B-G, EMB, Mac, TSI, Cit, S-S) 38, 39, 40

Exo-Enzymes produced by Bacteria 33

Carbohydrate Fermentation used to Identify Enteric Bacteria 34

Nitrate Reduction 35

Urea Hydrolysis 36

Oral Flora—Isolate and View Bacteria From Your Plaque 53

2 Videos on Common Viral Diseases and Exotic Viral Diseases

Video on PrPs, prion-proteins and TSEs (transmissible spongiform encephalopathies)

The Algae, View some Representative Types Handout

The Fungi, View some Representative Types Handout

The Protozoa, View some Representative and Medically significant Protozoans Handout
Demonstration of Lysozyme in Exocrine Sections (human tears).

LAB EXAM II

PREREQUISITE OR COREQUISITE: MICRO 130 (If you are taking both the Lecture and the Lab, if you drop MICRO 130, you must drop 140)

INSTRUCTOR: JOHN SHEN, 5-102, 845-9489, johnshen@hawaii.edu

EXAMS: 2 Lab Practicals each worth 25% of your grade

WRITE-UPS: ABOUT 10 to answer specific questions about an upcoming Lab. These are worth 25% of your grade.

ATTENDANCE: Mandatory. Near perfect attendance is expected of you. 4 or more absences will drop you ONE grade. 7 or more absences will drop you TWO Grades.

This course meets the Diversification Hallmarks for a Science Laboratory (DY)