

COCONINO COMMUNITY COLLEGE
COURSE OUTLINE

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Status: Special Topics

Effective Term: Spring 2017

A. Identification:

1. Course Subject: Biology (BIO)
2. Course Number: 298
3. Course Title: Bioscience Practicum I
4. Credit Hours: 6
5. Course Description: Pursuing a career in the Biosciences can be immensely rewarding and exciting. In this course you will begin to understand the natural world in which we live and address issues of personal well-being and worldwide concern, in the context of infectious disease and threats to human health. The course is broken into three modules/units:
 1. This is a model-based inquiry (MBI) unit during which students will study infectious disease in the context of an anchoring phenomenon: the 1854 cholera outbreak in London. Students will engage in three dimensional learning by studying disciplinary core ideas (including CTE Standards), scientific practices, and crosscutting concepts while developing a causal answer to the driving question. Through a series of authentic learning experiences, students will develop a deep understanding of infectious diseases such as cholera.
 2. This is a model-based inquiry (MBI) unit during which students will study infectious disease in the context of an anchoring phenomenon: E. coli food poisoning from Chipotle food. Students will engage in three dimensional learning by studying disciplinary core ideas (including CTE Standards), scientific practices, and crosscutting concepts while developing a causal answer to the driving question. Through a series of authentic learning experiences, students will develop a deep understanding of infectious diseases such as food poisoning.
 3. This is a model-based inquiry (MBI) unit during which students will study infectious disease in the context of an anchoring phenomenon: the recent H1N1 influenza infection in a Tucson resident. Students will engage in three dimensional learning by studying disciplinary core ideas (including CTE Standards), scientific practices, and crosscutting concepts while developing a causal answer to the driving question. Through a series of authentic learning experiences, students will develop a deep understanding of infectious diseases such as influenza

B. Course Goals:

To discover how infectious diseases spread in different ways and are caused by different pathogens. We have developed ways to study them and prevent their spread. Modern medicine allows us to effectively diagnose and treat infectious disease through the continual development of tools, procedures, technologies and medicines. Studying pathogens on the genomic level allows for the most accurate interpretation of an outbreak and development of the most precise tests and preventions.

C. Course Outcomes: Upon completion of this course, student will:

Arizona CTE Bioscience Standards:

- 1.1 - Identify and wear appropriate lab attire and personal protective equipment.
- 1.2 - Identify emergency contacts and practice emergency protocols.
- 1.3 - Apply information from safety data sheets (SDSs) for all chemicals used in the lab.
- 1.4 - Explain the importance of routine maintenance of equipment and reporting unsafe or nonfunctioning equipment.
- 1.5 - Maintain equipment log.
- 1.6 - Identify biological, biohazardous, and chemical materials and explain appropriate handling.

- 1.7 - Identify and comply with safety signs and symbols.
- 1.8 - Distinguish the characteristics of biosafety levels (e.g., BSL-1 to BSL-4).
- 1.9 - Identify standard operating procedures (SOPs) for monitoring, using, storing, and disposal of biological, biohazardous, and chemical materials.
- 1.10 - Identify standard operating procedures (SOPs) for biological, biohazardous, and chemical spills and/or waste, including broken glass.
- 2.0 - Demonstrate standard operating procedures (SOPs) in the laboratory.
- 2.1 - Identify and comply with state, local, and industry regulations (e.g., EPA, FDA, OSHA, NIH, AZDEQ).
- 2.2 - Use industry terminology (e.g., cGMP, GLP, SOP, CIP, SIP).
- 2.3 - Set up and maintain lab documentation according to standard operating procedures (SOPs) (e.g., paper and/or electronic notebook).
- 3.6 - Communicate results of scientific investigations in oral, written, and graphical form.
- 8.7 - Describe the purpose of and how to operate an autoclave.
- 9.1 - Maintain lab and equipment hygiene.
- 9.2 - Identify, prepare, sterilize, dispense, and store media.
- 14.2 - Utilize appropriate SI (International System of Units) base units and prefixes for all measurements (e.g., milli, micro, nano).
- 3.6 - Communicate results of scientific investigations in oral, written, and graphical form.
- 7.1 - Identify model organisms used in research.
- 7.2 - Identify proper use and limitations of living organisms, including alternatives when available.
- 7.3 - Examine local, state, and federal standards of practice for treatment, care, and maintenance of living organisms.
- 8.4 - Identify and demonstrate proper use of micropipettes.
- 8.9 - Prepare microscopic specimens and interpret results using appropriate microscopes (i.e., dissecting, compound, digital).
- 8.10 - Conduct gram staining and interpret results.
- 8.12 - Identify and demonstrate proper use of incubators, including shaking incubators.
- 8.15 - Perform electrophoresis.
- 9.1 - Maintain lab and equipment hygiene.
- 9.2 - Identify, prepare, sterilize, dispense, and store media.
- 9.3 - Identify, propagate, and quantify microorganisms and cells.
- 9.4 - Identify techniques for short- and long-term cultures.
- 9.5 - Isolate, maintain, and store pure cultures.
- 9.6 - Transform and maintain hosts (e.g., E. coli).
- 9.7 - Decontaminate and dispose of equipment, glassware, and biologicals, including disinfection with 0.5% sodium hypochlorite solution and sterilization using the autoclave.
- 11.1 - Calculate and prepare solutions and buffers.
- 11.2 - Calculate and prepare dilutions, including specific and serial.
- 11.3 - Calculate the molar mass of a given compound using a Periodic Table of Elements.
- 11.4 - Label and store solutions and buffers.

D. Course Outcomes Assessment will include:

1. Course grades determined by the instructor as outlined in the course syllabus;
 - Initial models (pre-assessment)
 - Lab notebook and class portfolio including all student work (formative assessments)
 - Final evidence-based explanation (summative assessment)

E. Course Content will include:

1. Lab safety and GLPs, along with a national certification.
2. Epidemiology, epidemiological triangles

3. Collin food poisoning
4. take a simple patient history, patient exam, focusing on pulse, temperature, throat, balance, and respiration.
5. Students will be able to diagnose illness by matching observed symptoms with diseases using a checklist and suggest the appropriate course of treatment.
6. Microbial Techniques:
 - a. Gram staining to determine Gram reaction of bacteria
 - b. determine cell shape and size
 - c. stain onion and cheek cells using three different stains
 - d. size of cells using the field of view or stage micrometer
 - e. observed under the microscope
 - f. demonstrate correct use of an incubator
 - g. antimicrobial properties of three chemicals
 - h. tenfold serial dilution of bacterial culture
 - i. concentration of (quantify) bacteria in a culture
 - j. streak an agar plate for single colonies (perform an isolation streak) and for growth.
 - k. transform *E. coli* HB101 bacteria with the pGLO plasmid
 - l. role of fomites in the chain of infection
 - m. various disinfectants to eliminate microorganisms present on various fomites
 - n. antimicrobial properties of three household chemicals
7. Cell Biology
 - a. disk diffusion assay using three chemicals and one negative control
 - b. use NEB cutter to predict where restriction enzymes will cut the bacteriophage lambda DNA sequence
 - c. produce a virtual gel image of lambda DNA cut with specific restriction enzymes
 - d. prepare agarose gels by calculating the amount of agarose powder needed to make 1% agarose, preparing gel trays, preparing and casting 1% agarose TAE gel, and removing gel combs
 - e. load and run dyes on an agarose gel
 - f. determine the charge of each electrophoresed dye
 - g. perform a restriction digest
 - h. generate a standard curve using a DNA size standard, and use to determine DNA fragment sizes
 - i. perform a restriction digest
 - j. drug resistant mutations quickly become prevalent in a bacterial population
 - k. expression of GFP with arabinose
8. Scientific Explanation
 - a. use models to represent ideas and explanations
 - b. decipher patterns and causal relationships from data (evidence)
 - c. models to represent ideas and explanations
 - d. communicate clearly and persuasively the ideas and methods they generate as the result of scientific investigations
 - e. professionally critique and evaluate models presented by other groups
 - f. obtain, evaluate and communicate information in written form, using academic language
 - g. engage in argumentation from evidence
 - h. Illness caused by a bacterial pathogen of their choice and apply the skills and knowledge gained through the unit to construct a causal explanation on the illness