COCONINO COMMUNITY COLLEGE
COURSE OUTLINE

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Status: Permanent
Effective Term: Fall 2018

A. Identification:
   1. Course Subject: Biology (BIO)
   2. Course Number: 131
   3. Course Title: Bioscience Practicum I
   4. Credit Hours: 4
   5. Course Description: 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 modules around epidemiological principles. Three lecture. One lab.

B. Course Goals: To analyze, evaluate and assess how infectious diseases spread in different ways and are caused by different pathogens. This includes using laboratory epidemiological techniques to study principles of disease transmission, treatment and pathogen identification.

C. Course Outcomes Upon completion of this course, student will:
   1. Identify and wear appropriate lab attire and personal protective equipment.
   2. Identify emergency contacts and practice emergency protocols.
   3. Apply information from safety data sheets (SDSs) for all chemicals used in the lab.
   4. Explain the importance of routine maintenance of equipment and reporting unsafe or nonfunctioning equipment.
   5. Maintain equipment log.
   6. Identify biological, biohazardous, and chemical materials and explain appropriate handling.
   7. Identify and comply with safety signs and symbols.
   8. Distinguish the characteristics of biosafety levels (e.g., BSL-1 to BSL-4).
   9. Identify standard operating procedures (SOPs) for monitoring, using, storing, and disposal of biological, biohazardous, and chemical materials.
   10. Identify standard operating procedures (SOPs) for biological, biohazardous, and chemical spills and/or waste, including broken glass.
   11. Demonstrate standard operating procedures (SOPs) in the laboratory.
   12. Identify and comply with state, local, and industry regulations (e.g., EPA, FDA, OSHA, NIH, AZDEQ).
   13. Use industry terminology (e.g., cGMP, GLP, SOP, CIP, SIP).
   14. Set up and maintain lab documentation according to standard operating procedures (SOPs) (e.g., paper and/or electronic notebook).
   15. Communicate results of scientific investigations in oral, written, and graphical form.
   16. Describe the purpose of and how to operate an autoclave.
   17. Maintain lab and equipment hygiene.
   18. Identify, prepare, sterilize, dispense, and store media.
   19. Utilize appropriate SI (International System of Units) base units and prefixes for all measurements (e.g., milli, micro, nano).
   20. Communicate results of scientific investigations in oral, written, and graphical form.
   21. Identify model organisms used in research.
   22. Identify proper use and limitations of living organisms, including alternatives when available.
   23. Examine local, state, and federal standards of practice for treatment, care, and maintenance of living organisms.

24. Identify and demonstrate proper use of micropipettes.
25. Prepare microscopic specimens and interpret results using appropriate microscopes (i.e., dissecting, compound, digital).
26. Conduct gram staining and interpret results.
27. Identify and demonstrate proper use of incubators, including shaking incubators.
28. Perform electrophoresis.
29. Maintain lab and equipment hygiene.
30. Identify, prepare, sterilize, dispense, and store media.
31. Identify, propagate, and quantify microorganisms and cells.
32. Identify techniques for short- and long-term cultures.
33. Isolate, maintain, and store pure cultures.
34. Transform and maintain hosts (e.g., *E. coli*).
35. Decontaminate and dispose of equipment, glassware, and biologicals, including disinfection with 0.5% sodium hypochlorite solution and sterilization using the autoclave.
36. Calculate and prepare solutions and buffers.
37. Calculate and prepare dilutions, including specific and serial.
38. Calculate the molar mass of a given compound using a Periodic Table of Elements.
39. 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;
   2. Initial models (pre-assessment)
   3. Lab notebook and class portfolio including all student work (formative assessments)
   4. 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. Taking a simple patient history, patient exam, focusing on pulse, temperature, throat, balance, and respiration.
   5. Diagnosing 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. determining cell shape and size
      c. staining onion and cheek cells using three different stains
      d. determining size of cells using the field of view or stage micrometer observed under the microscope
      e. demonstrating correct use of an incubator
      f. determining antimicrobial properties of three chemicals
      g. performing tenfold serial dilution of bacterial cultures
      h. quantifying concentration of bacteria in a culture
      i. streaking an agar plate for single colonies (perform an isolation streak) and for growth.
      j. transforming *E. coli* HB101 bacteria with the pGLO plasmid
      k. determining role of fomites in the chain of infection
      l. disinfecting microorganisms present on various fomites
      m. determining antimicrobial properties of three household chemicals and antibiotics
   7. Cell Biology
      a. performing a disk diffusion assay using three chemicals/antibiotics and one negative control
      b. using NEB cutter predicting where restriction enzymes will cut the bacteriophage lambda DNA sequence

c. producing a virtual gel image of lambda DNA cut with specific restriction enzymes
d. preparing 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. loading and running dyes on an agarose gel
f. determining the charge of each electrophoresed dye
g. performing a restriction digest assay
h. generating a standard curve using a DNA size standard, and determining DNA fragment sizes
i. performing a restriction digest assay
j. understanding how drug resistant mutations quickly become prevalent in a bacterial population

8. Scientific Explanation
    a. using models to represent ideas and explanations
    b. deciphering patterns and causal relationships from data (evidence)
    c. communicating clearly and persuasively the ideas and methods they generate as the result of scientific investigations
    d. obtaining, evaluating and communicating information in written form, using academic language
    e. engaging in argumentation from scientific evidence
    f. using a disease caused by a bacterial pathogen of students' choice and applying the skills and knowledge gained through the course to construct a causal explanation on the disease