

DEPARTMENT OF ANIMAL SCIENCE

COURSE OUTLINE – Fall 2024

AH174: LABORATORY PROCEDURES AND MICROBIOLOGY – 4.5 (4.5-0-3) 120 Hours for 16 Weeks

Northwestern Polytechnic acknowledges that our campuses are located on Treaty 8 territory, the ancestral and present-day home to many diverse First Nations, Metis, and Inuit people. We are grateful to work, live and learn on the traditional territory of Duncan's First Nation, Horse Lake First Nation and Sturgeon Lake Cree Nation, who are the original caretakers of this land.

We acknowledge the history of this land and we are thankful for the opportunity to walk together in friendship, where we will encourage and promote positive change for present and future generations.

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OFFICE HOURS: As posted

CALENDAR DESCRIPTION:

Students will develop proficiency in care and use of lab equipment, performing dilutions, conversions and quality control. Features of bacteria, fungi and viruses are discussed and basic microbiological agents are covered. Students will learn to group bacteria and fungi according to staining results, morphology and characteristics. Practical microbiological procedures will be performed or discussed to help differentiate common microbiological pathogens. Important veterinary infectious diseases and their clinical signs, treatment and human health implications are discussed. Case studies will be used in presentation of course material.



PREREQUISITE(S)/COREQUISITE:

- Must be registered in the NWP Veterinary Technology Program

REQUIRED TEXT/RESOURCE MATERIALS:

- Bassert, McCurnin's Clinical Textbook for Veterinary Technicians, Elsevier, 9th or 10th Edition
- Students must have internet access as the lecture part of the course may be online and lab preparatory work, assignments and submissions will be online.

DELIVERY MODE(S):

Lecture (Dr. Mizzi)

Lab (Kyla/Tara/Jori)

LEARNING OUTCOMES:

Lecture:

Unit1 Introduction to Microbiology. By the end of this unit the student will be able to Define and discuss:

- a. Key words listed by the instructor
- b. The 5 kingdoms of life and super kingdoms
- c. Differences between eukaryote and prokaryote
- d. Significance of bacterial taxonomy
- e. Bergey's method of classifying bacteria
- f. Nomenclature of microorganisms

Unit 2 Bacterial Physiology. By the end of this unit the student will be able to Define and discuss:

- a. Various cellular arrangements of a microorganism
- b. Difference between gram positive and Gram-negative organisms
- c. Bacterial structure and function of those parts
- d. Nutritional and environmental requirements of bacteria
- e. Process in which bacteria reproduce
- f. Stages of the bacterial growth curve
- g. 3 elements that control a bacterial infection
- h. Koch's postulates
- i. Bacterial pathogenicity

Unit 3 Identification of Bacteria. By the end of this unit the student will be able to Define and discuss:



- a. The cell shape and arrangement of microorganism
- b. Common ingredients in culture media
- c. Common types of culture media
- d. Different types of hemolysis
- e. Differences between selective and differential media
- f. Biochemical tests

Unit 4 Gram positive aerobic cocci. By the end of this unit the student will be able to Define and Discuss:

- a. The 2 families of Gram-positive cocci
- b. How to differentiate between the 2 families
- c. All the *Staphylococcus* species names
- d. General characteristics of Staph, bacteria
- e. Difference between contagious and environmental mastitis
- f. In detail the conditions associated with the various *Staph.* Bacteria
- g. The recommended treatment for infections covered in this unit
- h. All the *Streptococcus* species names
- i. Three methods of differentiating *Strep.* Organisms
- j. The general characteristics of *Strep.*
- k. Which organisms are Gram negative cocci
- l. Characteristics, pathogenesis and treatment of *M. bovis*

Unit 5 Gram positive rods. By the end of this unit the student will be able to Define and Discuss:

- a. The 2 types of endospore forming Gram negative rods
- b. General characteristics of *Clostridium* species
- c. Characteristics of *Listeria*
- d. Characteristic of *Erysipelothrix*
- e. Characteristics of *Corynebacterium*
- f. Characteristics of *Actinomyces*
- g. Characteristics of *Dermatophilus*
- h. Characteristics of *Nocardia*
- i. Characteristics of *Mycobacterium*



Unit 6 Gram negative rods. By the end of this unit the student will be able to Discuss and Define:

- a. The different classes of Gram-negative rods
- b. Characteristics of *E. coli*
- c. Characteristics of *Salmonella*
- d. Characteristics of other Gram-negative rods

Unit 7 Spiral Coiled and Unusual. By the end of this unit the student will be able to Define and Discuss:

- a. Characteristics of *Campylobacter*
- b. Characteristics of the spirochetes
- c. Characteristics of the intracellular bacteria
- d. Characteristics of cell wall free bacteria

Unit 8 Mycology. By the end of this unit the student will be able to Define and Discuss:

- a. The structure and physiology of molds and yeast
- b. How molds and yeast reproduce
- c. Characteristics of Superficial Mycosis
- d. Characteristics of Subcutaneous Mycosis
- e. Characteristics of Systemic Mycosis
- f. Characteristics of Yeast infections
- g. Characteristics of mycotoxins

Unit 9 Virology. By the end of this unit the student will be able to Define and Discuss:

- a. Composition of a virus
- b. Replication process of viruses
- c. Various tests to detect viruses
- d. Characteristics of common animal viruses
- e. Characteristics of prions

Lab:

Lab 1: Laboratory Safety and WHMIS. Upon completion of the lab students will be able to:

- a. Recognize and describe safety hazards within the NWP Animal Science Lab.



- b. Demonstrate steps on how to respond to hazards within the NWP Animal Science Lab.
- c. Demonstrate the proper use of fire extinguishers
- d. Discuss the usage of an eye wash station
- e. Explain the location of all exits, first aid kits, fire extinguishers, eye wash stations and SDS sheets within the Animal Science Building.
- f. Obtain WHMIS certificate

Lab 2: Compound Microscope and Instrumentation. Upon completion of this lab students will be able to:

- a. Define and discuss parts of a compound microscope
- b. Perform proper care and maintenance of the compound microscope
- c. Properly use the compound microscope in a veterinary laboratory
- d. Define and discuss basic principles of Stereo and Electron Microscopes
- e. Introduce Microbial Surveillance Quality Assurance Protocol

Lab 3: Bacteria Staining and Morphology. Upon completion of this lab students will be able to:

- a. Perform and explain the technique of aseptic transfer of bacteria
- b. Prepare a bacterial smear
- c. Perform a simple and differential stain and describe the chemical reaction involved in the staining process.

Lab 4: Quality Control. Upon completion of this lab students will be able to:

- a. Understand and apply sterile sample collection and plate inoculation.
- b. Complete direct smears with multiple staining techniques.

Lab 5: Bacterial Morphology and Identification of Unknown Organisms. Upon completion of this lab students will be able to:

- a. Aseptically transfer bacteria.
- b. Prepare bacterial smear.
- c. Evaluate hemolysis.
- d. State the purpose and perform the KOH test.

Lab 6: Dermatophyte Lab. Upon completion of this lab students will be able to:

- a. Explain the principle of a Fungassay or similar test.



- b. Perform and interpret a Fungassay or similar test.
- c. Name media used in culturing fungi.
- d. Explain the principle of the Woods Lamp.
- e. Explain procedures used in diagnosing ringworm.

Lab 7: Isolation of Pure Culture (Streak Plate Method). Upon completion of this lab students will be able to demonstrate and discuss:

- a. Methods of obtaining a pure culture of bacteria.
- b. Principle of streak dilution using living bacteria and Tryptic Soy Agar plate.

Lab 8: Basic Gram-Positive Organisms & Tests: Upon completion of this lab students will be able to:

- a. Identify gram positive organisms using a flow chart
- b. Demonstrate and discuss the procedure of tests used to differentiate gram positive organisms including:
 - a. Gram stain
 - b. Catalase test
 - c. Coagulase test

Lab 9: Gram Negative Organisms and Rapid Miniaturized Methods. Upon completion of this lab students will be able to:

- a. Perform a gram stain of bacteria provided.
- b. Plate bacteria on MacConkey Agar and describe colony morphology and results of the plated organisms.
- c. Perform, explain and interpret results of an Oxidase test

Lab 10: Reference Lab Tests. Upon completion of this lab students will be able to:

- a. Discuss and manage report to send sample to reference lab.
- b. Prep collected sample for shipping of specific tests. Ex. Trich Pouch

Lab 11: Culture and Sensitivity Testing. Upon completion of this lab students will be able to:

- a. Demonstrate and explain antibiotic sensitivity test procedures.
- b. Explain the importance of antibiotic sensitivity testing.
- c. Perform Kirby-Bauer method

Lab 12: Mastitis Project. Upon completion of this lab students will be able to:

- a. Demonstrate and explain the isolation and identification of bovine mastitis organisms.
- b. Perform antibiotic sensitivity testing on the isolates.
- c. Explain the use of a flow chart to complete the evaluation of milk samples
- d. Perform a California Mastitis Test with aseptic technique.
- e. Complete final project self-directed.

TRANSFERABILITY:

Please consult the Alberta Transfer Guide for more information. You may check to ensure the transferability of this course at the Alberta Transfer Guide main page <http://www.transferalberta.alberta.ca>.

** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. **Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability.**

EVALUATIONS:

GRADING CRITERIA :

Please note that most universities will not accept your course for transfer credit **IF** your grade is **less than C-**.

Grading Chart for courses with Alpha Grading:

Alpha Grade	4-point Equivalent	Percentage Guidelines	Alpha Grade	4-point Equivalent	Percentage Guidelines
A+	4.0	95-100	C+	2.3	67-69
A	4.0	85-94	C	2.0	63-66
A-	3.7	80-84	C-	1.7	60-62
B+	3.3	77-79	D+	1.3	55-59
B	3.0	73-76	D	1.0	50-54
B-	2.7	70-72	F	0.0	00-49

Grades for this course will be assigned as a percentage.

EXAMINATIONS	Mark Distribution
A. Quizzes, Lab & Assignments	30%
B. Midterm Exam (lecture)	20%
C. Final Exam (lecture)	25%
D. Final Exam (lab)	25%
	100%

A minimum of 60% must be obtained in order to successfully pass AH174. There will be a 5% deduction for each lab missed without a valid excuse.

COURSE SCHEDULE/TENTATIVE TIMELINE:

See posted schedule

STUDENT RESPONSIBILITIES:

Enrolment at NWP assumes that the student will become a responsible citizen of the Polytechnic. As such, each student will display a positive work ethic, take pride in and assist in the maintenance and preservation of Institute property, and assume responsibility for his/her education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting instructor expectations concerning attendance, assignments, deadlines, and appointments.

STATEMENT ON ACADEMIC MISCONDUCT:

Academic Misconduct will not be tolerated. For a more precise definition of academic misconduct and its consequences, refer to the Student Rights and Responsibilities policy available at <https://www.nwpolytech.ca/about/administration/policies/index.html>.

**Note: all Academic and Administrative policies are available on the same page.

Additional Information:

- Disruptive behavior in the class will result in the student being excused from the class or lab – this includes use of cell phones or any handheld equipment that has not been approved by the instructor.
- Any student wishing to see a marked quiz or exam must make an appointment with the instructor to view or go over.
- Attendance is mandatory at all laboratory sessions; valid reason for absence is required. For your safety, the safety of others and the safety of the animals there will be zero tolerance of anyone showing up for the laboratory sessions under the influence of alcohol or other medications which may cause physical impairment or disruptive behaviour. If you are on a standard or prescribed medication, please consult with your instructor prior to the lab. Labs or animal care sessions missed for the above reasons will also be considered as missed without a valid excuse and result in up to 5% deduction of final mark for every instance.
- If a student wishes to reschedule attendance to a lab (i.e. join another group), they must seek permission from the instructor prior to the event. Having a valid reason does not change the student's responsibility to acquire the information dispensed during the lab or lecture, nor their obligation to finish required assignments or achieve competencies practiced.
- Students are expected to show up prepared for lab. This includes, but is not limited to appropriate clothing, equipment and knowledge (assigned readings). Failure to do so will result in student dismissal from lab to acquire what is necessary and a deduction in the lab prep portion.