Pathogenic Microbiology
BIOL 4353/4350L WI01

Instructor: Dr. Melanie Coombs
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Note: *Please note that your emails to me should only come from your Acadia email address. Other email addresses may get lost in my junk mail.*

Lecture:
MWF, HSH 141,
9:30 - 10:20 am

Lab: BIO 4350L
T, BIO 250, 1 - 3:50 pm

Evaluation	Percentage	Date/Deadline
Test	15%	Feb 4 DURING LAB time *Grade:* - *20% booklet* - *80% solving cases*
Lab	30%	Weekly (see current schedule in Moodle)
Case report from literature	10%	Feb 28
Mock Trial	10%	Feb 10 – sign up Mar 11 – Discuss evidence for use at trial (lab) Mar 14 – Evidence for use at trial due Mar 24 – Mock trial preparation Mar 25 – Mock trial presentations (lab)
Moodle quizzes	10%	Weekly (see Moodle)
Final exam (Full term)	25%	Scheduled by the registrar *Grade:* - *20% booklet* - *80% solving cases*

Part 1: Course Information

Course Description

This course examines the ceaseless struggle between the antimicrobial defences of humans and the virulence factors of bacterial, viral and protozoan pathogens. Important human infectious diseases will be studied as examples of the contest between hosts and disease-causing organisms, and as examples of how modern medicine is driving the evolution of human pathogens. Laboratory required (3 hours/week).

Course Pre-requisites

Biol 3553 with a minimum grade of C+.

Course Textbooks (required)

Cowan and Steel's Manual for the Identification of Medical Bacteria. 3rd edition. Cambridge University Press. ISBN 0521543282.

Nester's Microbiology – A Human Perspective, 10th edition, 2022 Anderson, Salm and Beins, by McGraw Hill Education, ISBN: 978-1-265-06231-6.

Student Learning Outcomes

- Describe pathogenesis of diverse infectious microbes.
- Understand the evasion strategies of microbes to our immune system.

- Understand virulence.
- Understand the mechanism of action of antimicrobial medications.

How to Meet the Learning Outcomes

1. Come to lectures on a regular basis, take notes, and ask for clarification when something is unclear.
2. Take part in weekly class activities. These will give you insight as to how well you understand the information being presented. A phone, tablet or laptop will be needed for class/lab activities to measure understanding/retention weekly.
3. Access the course Moodle page each week. Lecture images, course outline and contact info will be available on Moodle (https://moodle.acadiau.ca).
4. Reading and using the textbooks each week to solve case studies in class.
5. Complete tests (1 test, 1 final exam) and quizzes.
6. Complete the case report.
7. Complete and participate in the mock trial/s.
8. Participate and ask questions during the Lab.

Part 2: Course Plan

The instructor reserves the right to amend the course plan with reasonable notice, and in consultation with the class.

Note: Concepts from Nester's Microbiology – A Human Perspective regarding vaccines, epidemiology and antimicrobial medications (Ch 16, 18, 19 & 20) will be discussed in some detail as we discuss specific infections. Slides from these chapters are posted in Moodle as a resource.

Lecture schedule:

Jan 6 – Introduction to the course and Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 8 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 10 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 13 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 15 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 17 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 20 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 22 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 24 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 27 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 29 – Infections of the Upper and Lower Respiratory System (Ch 21)
Jan 31 – Infections of the Upper and Lower Respiratory System (Ch 21)
Feb 3 – Infections of the Upper and Lower Respiratory System (Ch 21)

- **FEB 4 - TEST DURING LAB**

Feb 5 – Skin Infections (Ch 22)
Feb 7 – Skin Infections (Ch 22)
Feb 10 – Skin Infections (Ch 22)
Feb 12 – Skin Infections (Ch 22)
Feb 14 – Skin Infections (Ch 22)
Feb 17 – **Heritage day – No Class**
Feb 19 – **Winter study break – No Class**
Feb 21 – **Winter study break – No Class**
Feb 24 – Upper and Lower Digestive System Infections (Ch 24)
Feb 26 – Upper and Lower Digestive System Infections (Ch 24)
Feb 28 – Upper and Lower Digestive System Infections (Ch 24)

- **Case report from literature due (end of the day Feb 28th)**

Mar 3 – Upper and Lower Digestive System Infections (Ch 24)
Mar 5 – Upper and Lower Digestive System Infections (Ch 24)
Mar 7 – Upper and Lower Digestive System Infections (Ch 24)
Mar 10 – Upper and Lower Digestive System Infections (Ch 24)
Mar 12 – Upper and Lower Digestive System Infections (Ch 24)
Mar 14 – Blood and Lymphatic Infections (Ch 25)
- **Evidence for use at trial due Mar 14**

Mar 17 – Blood and Lymphatic Infections (Ch 25)
Mar 19 – Blood and Lymphatic Infections (Ch 25)
Mar 21 – Genitourinary Tract Infections (Ch 27)
Mar 24 – **Mock Trial preparation**
Mar 26 – Genitourinary Tract Infections (Ch 27)
Mar 28 – Genitourinary Tract Infections (Ch 27)
Mar 31 – Nervous System Infections (Ch 26)
Apr 2 – Nervous System Infections (Ch 26)
Apr 4 – Nervous System Infections (Ch 26)

Lab schedule:

Week of	LAB	Description
Jan 7	1-wet lab	• Start *Staphylococcus* lab (comeback times)
Jan 14	2-wet lab	• Start *Streptococcus* lab (comeback times) • Start Koch's postulates lab OR start the latex antibody cell agglutination (O157) lab (comeback times) - *Note this depends on plant growth*
Jan 21	3-tutorial	• Comeback times in Bio lab 348 • ***Staphylococcus lab due Jan 21st in lab***
Jan 28	4-wet lab	• Start the Gram negative lab (comeback times) • Start Koch's postulates lab OR start the latex antibody cell agglutination (O157) lab (comeback times) - *Note this depends on plant growth* • ***Streptococcus lab due Jan 28th in lab***
Feb 4	5-tutorial	**MIDTERM TEST**
Feb 11	6-wet lab	• Start Clinical unknown lab (note: you will need to make a plan and start working on this independently in your groups). Samples will need to be saved and stored in the fridge over the study break. • Measure plants from Koch's postulates lab • ***Gram negative lab due Feb 11th in lab***
Feb 18	**break**	**NO LABS**
Feb 25	7-tutorial	• ***Submit a proposed plan for the clinical unknown based on preliminary findings*** • Work on Clinical unknown in Bio lab 348 • Measure plants from Koch's postulates lab
Mar 4	8-wet lab	• Work on Clinical unknown in Bio lab 250 • Measure plants from Koch's postulates lab (depends on plant growth) • Harvest plants from Koch's postulates lab (depends on plant growth) • ***Latex antibody cell agglutination lab due Mar 4th in lab***
Mar 11	9-tutorial	• Discussion of Mock Trial evidence • Identification of an unknown bacterium from a clinical specimen lab work in Bio lab 348 • Measure plants from Koch's postulates lab (depends on plant growth)
Mar 18	10-wet lab	• Harvest plants from Koch's postulates lab (depends on plant growth) • Gram stain from plants (during comeback times) • Work on Clinical unknown in Bio lab 250 • **Mar 21st – all clinical unknown lab work must be completed** • ***Koch's postulates lab due by Fri Mar 21st by 4 pm***
Mar 25	11-tutorial	• Mock trials • ***Identification of clinical unknown lab due by Fri Mar 28th by 4 pm***
Apr 1	12	**NO LAB**

Note: Our lab will often have comeback times that will need to be arranged around your schedule

Part 3: Assessment and Grading

You are required to pass the lab to pass the course.

Grading scheme

A+: 90-100	B+: 77-79	C+: 67-69	D+: 57-59	F: <50
A : 85-89	B : 73-76	C : 63-66	D : 53-56	
A-: 80-84	B-: 70-72	C-: 60-62	D-: 50-52	

Part 4: Course Policies

Tests

Our tests are largely application-based, therefore you will be asked to prepare a booklet of interpreting biochemical tests to solve case studies that were used in lab or mentioned in class. Additionally, you will be responsible for knowing the most important virulence factors associated with the pathogen in the case and discussing the interactions with the immune response, if we covered them in class. The virulence factors and immune response details may be in the booklet that you prepare for each microbe. You may also bring your textbooks in to complete your tests. You should include in your booklet any charts or interpretations that may be useful in solving a case, based on the lab results presented. Before you leave the test, you need to verify that you are on the right track. Your test grade will be lowered by 5% for each check-in or guidance request above one check-in. *Your test grade will be decided by a combination of being correct, showing your path to get there, interpreting lab results correctly, the quality of the booklet made, the number of check-ins and guidance needed to solve the case, explaining the interaction with the immune system, and describing the key virulence factors.*

Note: Students need to contact the instructor with a valid reason for missing a test in advance of the test. Students will also need to fill out a Declaration of Cause form to the Registrar. Make-up tests for poor performance, will not be provided as an option. In the event that you have a *valid* excuse for missing a test, the weight from the missed test will be distributed to the final exam. Missed tests without a valid excuse will result in a mark of zero. University policies on missing classes, etc. can be found here:
https://registrar.acadiau.ca/RecordsandOtherRequests.html

Attend Class (Lectures)

Students are expected to attend all class sessions as listed above. Classes are interactive and you will be working on cases to learn course content. Studies have shown, that students who take notes by hand (rather than typing on a computer) perform significantly better in their ability to retain information. While you will be using laptops or tablets during lectures, please limit their use to classroom material only. Using them for other purposes (i.e. social media) will negatively impact your ability to learn.

Labs

Attendance in labs is mandatory. If you are unwell, please email your instructor before the lab begins. Pre-labs may be posted in advance and you will be expected to read and answer questions based on material posted in advance. There are multiple comeback times each week where you will need to come back to complete your experiments. If you have a major concern about a lab grade please contact me to discuss (Dr. Coombs). If you want changes made to your grade, I will re-grade the entire lab report.

Graded Moodle quizzes
10% of your final mark will be based on your final grade in weekly quizzes in Moodle. These quizzes will help your understanding of concepts. You will be able to re-try the quizzes an unlimited amount of times up until the deadline (approximately 1 week after posted). The highest grade attained will be used. Please note quizzes will occur regularly each week and you will be responsible for completing them on time. A missed quiz will result in a '0'. Once the quiz closes you will not be allowed to submit the quiz, and there will be no make-up for the quizzes unless you have contacted me in advance describing the valid reason for requesting an extension.

BONUS Moodle in-class live quizzes/activities
Participation in in-class live quizzes/activities will be recorded and result in a proportion of a bonus mark which will give you up to an additional 2% on your final grade. These live quizzes/activities will help your understanding of concepts. Please note these quizzes/activities may occur in any class. There will be no make-up for the live in-class bonus quizzes/activities.

Case report from literature
Briefly, you will be asked to search for a journal article reporting a case report of an individual with a microbial infection. You will be asked to prepare a set of 5-7 case study questions and answers (with citations) based on the case report you have chosen.

Late assessments

Late assessments of any kind are not accepted after the deadline. A late assessment will result in a grade of '0' unless there is a discussion (in advance of the deadline) with me describing the valid reason for requesting an extension.

Part 5: University Policies

University policies are available in the Acadia University Academic Calendar or through the Registrar's website: https://registrar.acadiau.ca/welcometotheregistrarsoffice.html

Equity, Diversity and Inclusion
Acadia University is committed to becoming a culturally safe and anti-oppressive community. This can only be achieved where there are simultaneous efforts to eliminate all forms of discrimination and harassment from our campus community, including the elimination of all discrimination, harassment and violence based on one's identity, including but not limited to, gender, race, class, ethnicity, sexual orientation, disability, gender identity, gender expression, and Indigeneity. The policy against harassment and discrimination, and resources for students who believe they may have experienced, or witnessed, discrimination or harassment, are available here: https://www2.acadiau.ca/student-life/equity-judicial/equity.html

Last Drop Day
Last day to drop a course and receive a "W". Please check the Acadia University calendar dates, which are available here: https://registrar.acadiau.ca/AcademicCalendars.html

Inform Your Instructor of Accommodations
Acadia University is dedicated to improving access to campus life for all students with disabilities. While we attempt to ensure that all courses are accessible, we recognize that there are barriers that need to be addressed on an individual basis. Students who require accommodations to complete coursework or otherwise fully participate in class should contact Accessible Learning Services directly as soon as possible. https://www2.acadiau.ca/student-life/accessiblelearning.html

The Use of Animals in Teaching and Research

The use of animals in teaching and research at Acadia University is done in accordance with guidelines on the care and use of animals published by the Canadian Council on Animal Care (CCAC). For more information on the CCAC, please visit their website at http://www.ccac.ca

Commitment to Integrity

It is standard practice in Biology to check exams and assignments for cheating and plagiarism. Cheating in the class and/or lab, including plagiarism, will not be tolerated. Please read the appropriate sections of the current Acadia University Academic Calendar: https://registrar.acadiau.ca/AcademicCalendars.html

Information on copy-write and course content from Acadia University is available through the Vaughan Memorial Library: http://libguides.acadiau.ca/c.php?g=433650&p=5027078

The spoken and written course content (including the syllabus, handouts, lectures, presentations, labs, assignments, quizzes, tests, and exams) are the intellectual property of the instructor and may only be copied for personal use. Sharing these materials or uploading them where they may be accessed by others is a violation of copyright. If you wish to make audio, video, or photographic recordings in class, you must first obtain the consent of the instructor and of any other persons (e.g., guest speakers, other students) who may be captured in such recordings. In the case of personal use by students with disabilities, the instructor's consent shall not be unreasonably withheld.

Acadia is a Scent-Free Campus

In consideration of the difficulties that exposure to scented products causes individuals with sensitivities and allergies, all students, faculty, staff, employees of any companies working on university property, visitors, and guests of Acadia University, or of members of the University community are asked to refrain from wearing scented personal care products such as perfumes / aftershave, lotions, hair spray and deodorant. In addition, users of tobacco and cannabis are asked to be aware that odours associated with product use may impact individuals with sensitivities and allergies. Acadia University in consultation with its contracted cleaning staff, have agreed to use products that do not leave residual odors that may cause difficulties for individuals with sensitivities and allergies.

Part 6: Program Learning Outcomes

Foundations of knowledge		**Course specific examples**	**Proficiency** 1-Introduction 2-Reinforcement 3-Proficient **NA-not applicable**
Scientific method, inquiry and hypothesis testing	Find, understand and apply information from the literature; understand how to use the scientific method to examine problems from different perspectives	Work through course material through case studies. Examine published work and critical interpretation of data/findings.	3
Historical concepts and contributions by important figures	Explain foundational concepts in biology, Two-eyed Seeing, and ethical implications of scientific discoveries	NA	NA
Biodiversity and ecology	Understand the genetic, taxonomic and ecosystem levels of biodiversity; focus on SW Nova including the Acadian Forest and Bay of Fundy ecosystems	Examine biochemical differences in microbes and how we can identify biodiverse microbes.	2
Genetics and evolution	Understand the chemical basis of heredity, genetics and genomics; integrate concepts across disciplines to understand evolution	The role of genetics in pathogenesis. Resistance, mutations and horizontal gene transfer.	3
Human and environmental health	Understand form and function in health and disease within a One Health framework, integrating human and environmental health	Role of human health, behavior, and the environment in microbial pathogenesis.	3
Lab and field skills			
Experimental design	Gain experience in applying the scientific method	Designing experiments to solve for an unknown pathogen in a sample.	2
Safety	Work safely and productively in lab and field settings	Safety with microbes. Aseptic techniques.	3
Lab skills	Gain experience with basic and advanced lab techniques and understand their application in research, health science and industry	Advanced lab techniques in bacterial diagnostics. Microscopy and biochemical assays.	3
Field skills	Gain experience in basic and advanced field skills and understand their application in ecology, conservation biology and environmental change	NA	NA
Data acquisition, analysis and interpretations	Collect data, present results both qualitatively and quantitatively, and interpret outcomes in light of the literature	Students will examine data obtained and compare to published articles and discuss/critique interpretations.	3
Statistical analysis	Use R and or other programs to analyze biological data	NA	NA
Professional skills			
Ethical practices	Demonstrate ethical conduct, apply principles of academic integrity and understand the principles of EDI in science	Historically society has not recognized contribution of scientists from underrepresented groups. Several of these figures are highlighted and discussed.	1
Collaboration and group work	Work effectively in groups within and across disciplines	Students work in groups during lab sessions. Work as teams through case studies. Work together to understand human behavior, laws and role of community in spread of disease through a mock trial.	3
Critical thinking	Analyze and evaluate information to make science-based decisions	Work through steps to identify a pathogen.	3
Computer proficiency	Use common and discipline- specific software	NA	NA
Scientific communication	Communicate science effectively to both scientific and general audiences	Students participate in a mock trial discussing the pathogenesis of a microbe.	2