Course outline

Biology 2910: Laboratory biology
WAO section
2025W

THE BASICS

Responsibility for delivering Lab Biology is split evenly between two people:

Person	**Title**	**Office** *OA*	**Email** *@lakeheadu.ca*	**Responsibilities**
Dr. Usha Menon	Biology lab technician (lab instructor)	3003	umenon	• Prepares for and coordinates lab sessions • Runs Tuesday 3-h lab sessions • Runs and marks prelab quizzes • Marks lab material: notebooks, reports, etc.
Dr. David Law	Course instructor (lecturer and lab instructor)	3004	dlaw	• Runs Monday 1-h lectures • Runs Wednesday 2-h lab sessions • Marks lecture material: Zoom quizzes, final exam, etc.

Discuss lecture issues with me and any lab issues with either Dr. Menon or me.

- Notes about contacting Dr. Law
    - No scheduled office hour. Talk to me in person during the weekly Wednesday 2-h lab slot, or email me to make an appointment to talk in person or on Zoom.
    - Email me using either the lakeheadu.ca email address above or the email within myCourseLink. I will check my email daily Monday to Friday, and will try to respond to your questions as quickly as possible during those days.

Class info

Lectures

- Live (synchronous) on Zoom
- Mondays, 10:30 AM - 11:20 AM
- All lecture info is in myCourseLink under **Content > Lectures**

Labs

- OA 3002
- Lab session 1 (3 h/week): Tuesdays 11:30 AM - 2:30 PM
- Lab session 2 (2 h/week): Wednesdays 10:30 AM - 12:30 PM
- All lab info is in myCourseLink under **Content > Labs**

Notes

- Winter Study Week is Monday, February 17 - Friday, February 21. No classes or labs that week.
- Other important dates are in the academic schedule of dates:
    - Final date to add a course for 2025W: Fri. Jan. 17
    - Final date to withdraw from a course without academic penalty (a/k/a drop date): Fri. March 7
        - We aim to provide you with at least 25% of your final mark by this date so that you can make an informed decision about your progress and projected future performance in the course.
- Dr. Menon and I post all course information in myCourseLink. New info will be in **Announcements**, so check there regularly. I only send emails to the class for urgent matters (e.g., class cancellation).

Calendar description

Course number and name	Biology 2910 | Laboratory Biology
Description	Introduction to basic laboratory techniques: pipetting, preparation of media, aseptic technique, cell disruption, protein purification and analysis, electrophoresis, chromatography. Development of skills in such areas as: laboratory note-keeping, reporting, graphical presentation of data, information searching.
Credit weight	0.5
Prerequisite(s)	Biology 1050 and 1.0 FCE Chemistry
Offering	0-0; 1-5
Notes	An additional fee (see Miscellaneous Fees) is required for this course.
Course classifications	Type C: Engineering, Mathematical and Natural Sciences

LEARNING OUTCOMES

We aim to create a meaningful and creative lab experience for students who are interested in exploring experimental biology, and give you the skills necessary to work or study in many other related areas, such as medicine, environmental studies, forensics or biotechnology.

During this course, you will...

- develop and improve hard skills necessary for lab-based molecular biology, including
    - pipetting
    - weighing
    - spectrometry
    - buffer preparation
    - tissue collection and homogenization
    - centrifugation
    - chromatography
    - antibodies to detect proteins

    - electrophoresis
    - biomacromolecule purification, identification and characterization
- develop and improve soft biological skills, such as
    - working with your peers
    - conceiving, writing and delivering written work by applying information obtained in lecture, from your textbook and from other scientific sources

By the end of this course, you will be able to...

- work safely in the lab
- perform various laboratory techniques using DNA and protein
- perform laboratory experiments
- write formal lab reports by applying information obtained in lecture, from your textbook and from other scientific sources to the data you obtain in the lab
- work effectively as a member of a research team
- keep effective records of your work in the laboratory
- find information necessary to do laboratory work using the university library
- understand common terms used in laboratory biology
- feel comfortable asking questions based on the scientific content of your and others' work
- discuss topics relevant to laboratory biology, which may include genomics, protein structure, and array technology

IN-PERSON LABS AND ZOOM LECTURES

All 5 h of weekly labs will be delivered in-person.

The 1-h weekly Monday review/lecture is via Zoom. I'll provide links to the Zoom sessions in Calendar on the right hand side of the myCourseLink course homepage. Note that I will record the Monday lectures and post these in myCourseLink for your later review. As with all Zoom recordings, the images and voices of students present may be recorded. These recordings are strictly confidential and may be used only by the instructor and students registered in the course only for purposes related to the course, and may not be otherwise shared or distributed. Students who are concerned about being recorded may ask me in an email to exclude them from the recording to the greatest extent possible while recognizing that this may not always be possible. These recordings are made under the authority of sections 3 and 14 of the Lakehead University Act, 1965. Questions about the collection of images and sounds in these recordings may be directed to the chair of biology, Dr. Azim Mallik (amallik@lakeheadu.ca).

Here are two tips to do well:

- **Be courteous and participate in class**

  We should all be patient and kind to others during labs and lectures. Dr. Menon and I appreciate feedback letting us know what does and doesn't work. Speak up right away so we can attempt to fix any issue you may have.

  I ask a lot of questions during lectures. I welcome volunteers to answer. I also plan to call on students by name to answer some simple questions during class, so be prepared for that. This isn't to embarrass you but rather to make you more comfortable participating in group work and offering your opinion in front of others, both of which will be a major part of your university life and future career.

- **Attend lectures to receive participation marks**

  I'll ask questions during the Zoom sessions using Zoom polling. You have to be present during lectures to participate in the polling questions and receive participation marks.

  Note that this course is listed in the academic calendar as "1,5", meaning that each week there are 5 hours of lab work (spread over 2 lab sessions) and a 1-hour lecture/tutorial.

  Lectures will be review sessions based on what you covered that week in the lab sessions. We will also do some practice problems to hone your calculation and logic skills prior to writing up your labs and writing the final exam in April. If we have time, we'll discuss the upcoming week's labs too.

LECTURE AND LAB SCHEDULE

Lectures

Following is a **preliminary** schedule of the material we'll cover in the lectures and lab sessions.

Since the lectures are mostly review sessions, material won't be posted beforehand, but I will record the sessions and post them on myCourseLink for your review afterwards. Zoom polling will take place at the start of each session and will be a brief review of the previous week's lecture and lab material.

Labs

These will follow the preliminary schedule below. The schedule may change due to lab and/or weather challenges.

Week #	Week start date (Monday)	Material covered
1	Jan. 6	• No lab, but complete your WHMIS training and submit certificate to Dr. Menon via email
2	Jan. 13	• Lab orientation • WHMIS • Lab safety • Safety quiz • Lab notebooks • Excel/Sheets graphing • Report writing
3	Jan. 20	• Pipetting • Measuring • Balance • How to make solutions • pH • Molarity
4	Jan. 27	• Chlorophyll extraction and measurement
5	Feb. 3	• Protein extraction • Bradford assay • Protein quantification
6	Feb. 10	• Protein utilization in peas
7	Feb. 24	• Size exclusion/gel filtration chromatography

8	Mar. 2	• Protein extraction I
		  ○ SDS/PAGE gel electrophoresis
		  ○ Gel staining

9	Mar. 9	• Protein extraction II
		  ○ Western/immunoblot
		  ○ Immunodetection

10	Mar. 16	• DNA extraction

		• PCR • Agarose gel electrophoresis
11	Mar. 23	• Review
12	Mar. 30	• All reports due

LEARNING MATERIALS

Textbook

There is no official textbook. Any readings will either be freely available online or posted on myCourseLink. The information provided below complies with the Ontario Ministry of Colleges and Universities requirement for disclosing the cost of learning materials to students.

Cost of textbooks and learning materials	None
Restrictions preventing students using a different edition of the textbook or other learning material	None
Use of Open Educational Resources (free resources)	None
Required use of educational materials previously acquired for another course	Yes; lab coat and safety glasses

MARKING SCHEME

Our major emphasis is on lab skills as reflected in the marking scheme.

Component	**% final mark**
2 Experimental reports (2 x 10%)	20
3 Technical reports (3 x 5%)	15
Pre-lab quizzes	20
Lab book	10
Lab technique and lab participation	5
Lecture participation via Zoom polling	5
Final exam (on Lecture material only)	25
TOTAL	**100**

Notes

- Format and expectations for both types of reports are outlined in the lab write up module. Any assignment handed in late will have 5% of its grade deducted for each day late. Please follow the lab schedule and outline to see what type of report each lab exercise has. Students can choose to submit 2 Experimental reports and 3 Technical reports that will be graded.
- Before each lab, there will be a quiz based on the pre-lab questions that tests your preparation for the lab.
- The final exam will take place in late March; date TBD by the class. It will cover material from the 1-h Monday lectures only.

STUDENT PARTICIPATION

Student participation sessions will use **Zoom polling** during the Monday lectures only. You don't have to do anything on your end except vote for a question when I ask it during class. Most of you have taken a course with me where I've asked iClicker questions; the Zoom polls will be very similar.

Five percent of your final mark is allocated to lecture participation. In each lecture, you will answer questions that are based on the course material. The 5% participation mark will be equally weighted for

- Attendance (2.5%), and
- Correct answers (2.5%).

Therefore, to receive a high participation mark, come to the lectures and do your best to answer the poll questions.

You may miss 2 lectures without penalty to your participation mark. For example, if there are 11 classes where we poll, you need to be present for 9 of these to receive full credit for attendance.

EXAMS AND DUE DATES

This class has a large number of deliverables: lab reports, quizzes, etc. You'll have to have good time management skills to meet deadlines. Late lab reports will be accepted, but for each day after the due date, 10% will be deducted from the assignment grade. If you miss a weekly lab quiz, you may write a replacement test, but you must provide acceptable supporting documentation within 48 h of the missed test to me and Dr. Menon. If required, there will be one date for a make-up test and no make-up test can be written after the test results have been returned to the class. This also applies to students registered with SAS. Missed final exams require you to follow the protocol provided by Enrolment Services.

If you're having trouble finishing quizzes or lab reports in the assigned time, contact me and/or SAS to find a solution.

STUDENT FEEDBACK ON TEACHING AND COURSE IMPROVEMENT

I value student feedback to help me improve my courses. Below are some data from the Student Feedback on Teaching (SFT) survey the last time I taught this course in 2024W.

Comments

Student comments in 2024W centred around three main themes to improve the course:

- **Coordinate labs better/improve communication between Dr. Menon and me.** We talk all the time about the course material and how to deliver a good lab experience for you. We will continue to do so this year and will further up our game.
- **I should be better organized when I run the labs.** Sometimes I pretend not to know what is going on in the lab as a way of figuring out how much you know. I may use this technique this year. Telling me what you've done and what the next steps are show me that you know what is going on. Since you're in second year (or higher) now, this is a way of pushing you to take more responsibility about techniques and results in the lab. Dr. Menon and I love lab biochemistry and have done all of the techniques a few times in our research careers… we can't wait to shart them with you. Expect us to give you more control over your techniques and calculations this year.
- **Be clearer about lab expectations.** Students found it confusing that results could be presented and calculated in multiple ways. The reality of biology is that you can come to the same results in many different ways. Sometimes as you're calculating a result, you might find a better way to do so or to state what you've found (e.g., using multiple units to express concentration, like mg/mL, mM, etc.). We'll encourage you to explore these and point out the best ones, trying to synthesize some of the biology and chemistry knowledge you've gained so far in lectures and labs.

Marks

For the 23 questions where 1 = strongly disagree (worse score) and 5 = strongly agree (better score),

- Average score = 4.07 / 5
- Standard deviation +/- 0.40
- Number of survey participants = 3 to 5 (depending on question) out of 10 total students

ACADEMIC DISHONESTY

Lakehead has a Student Code of Conduct – Academic Integrity. All students in this course should read the Code and become familiar with it.

To summarize the relevant parts of the Code, the penalty for plagiarism or cheating on any part of this or any other course is zero for the work where the student is caught. Serious or repeated plagiarism, including cheating on an examination or test, will result in a mark of zero for the course and may result in expulsion from Lakehead.

There are three particular places in this course where cheating might occur:

1. submitting written work that you did not research and write;
2. using written or electronic notes to confer with another person in a test or examination; or
3. voting electronically in place of another person during polling.

Academic dishonesty for any of these areas will result in a mark of **zero** for the work concerned.

To ensure academic fairness for students who work hard, rest assured that the course instructors will take **every precaution** to ensure that potential cheaters are caught and subjected to the appropriate penalty.

USING ARTIFICIAL INTELLIGENCE

Wondering whether you can use AI like ChatGPT to complete coursework? You're not alone. First, read Lakehead's checklist for its appropriate use. Using AI may violate the Lakehead Academic Integrity Code (Section III) and be subject to disciplinary action. It's best to check with me prior to using it if you are unsure. There is no shame in doing so since I'm very aware of these tools. As this technology evolves, it's up to your instructors to ensure that student marks reflect their own work.

To get an idea about how chatbots can be used in higher ed, watch this Vox video. It summarizes my thoughts about acceptable and unacceptable use of AI to complete coursework.

A list of the possible ways to use AI for your coursework as listed in the Vox video is below. I'm OK if you use AI for most of their examples; exceptions are listed below:

Research

- Answers to a homework question (sometimes)

    - It's very tempting to let AI do all the work and once you have it for you to say "I have the answer; I'll go back and understand it later". But will you?
    - As long as you're not handing in the answer for marks… where is the ethical line?
- Background information on a topic
- Definitions or explanations of a concept
- Sources to find more information
    - To me, these 3 uses are no different than a Google search or looking up a topic on Wikipedia, but keep in mind how flawed these sources can be
    - Your sources must be
        - Genuine and relevant
        - Specifically, mostly reviews and primary literature articles from peer-reviewed journals
- Summaries of readings and lectures
- Study guides for an exam
    - OK, but read and/or watch these first to make sure you understand and can summarize them without AI help

Ideas

- Ideas for how to respond to an assignment
    - But not using AI to actually write your assignment…again, where is the line?
- Instructions for solving a problem
    - But don't rely on it to do your work for you since you'll have to do it yourself on a test
- Outline for a paper or presentation
    - AI can suggest how to best organize your thoughts
- Examples, analogies and counterarguments
    - Use at your own risk

Writing

- Script for a presentation
    - As long as it's based on your own original work and not AI-generated text… AI summarizing AI is bad
- Feedback on your work
    - This one is for your profs. I haven't used AI yet for this purpose, but I can see how it might be useful
- Revision of a text to improve it
    - While being aware that AI doesn't always "improve" written work
- Revision of a text to change word count
    - Sometimes a necessary editing step

    - Summarizing and collating ideas is a key part of work life, and AI doesn't always do a great job

There's only one use of AI from the Vox list that I consider plagiarism:

- Writing a draft of a paper or discussion post
    - It's too tempting to let it do all the work, including writing the final version