Biology 1050: Introduction to cell and molecular biology

Course outline

FAO section

2024F

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THE BASICS

About the instructor

My name	Dr. David Law
My office	Simcoe Hall/OA 3004
My email	dlaw@lakeheadu.ca. I check my email daily Monday to Friday, and will try to respond to your questions as quickly as possible during those days.
Office hour	No preset office hour; email me or make an appointment here for a Zoom meeting.
My phone number	None; email me or make an appointment here for a Zoom meeting.
Call me	Dr. Law or David
My preferred pronouns	He, him, you

About the class

- The course runs for 13 weeks: Wednesday September 4 to Monday December 2, 2024. The full academic schedule of dates is here.
- The course has 12 weeks of 2 x 1.5-h lectures. There are no classes the week of October 9-13 due to the Lakehead fall study week.
- Biology 1050 lectures and labs are offered in-person on the Orillia campus.
- All course material is posted on MyInfo/D2L; check there for the latest course updates and information.
- There is 6 h total instruction time each week:
    - Lectures: 3 h/week
        - OA building, room 2015
        - Mondays and Wednesdays, 10:00 - 11:20 AM
    - Labs: 3 h/week
        - OA building, room 3002
        - Thursdays, 11:30 AM - 2:20 PM
        - All lab information is on the separate BIOL-1050-FO2 D2L site

- Dr. Usha Menon is your lab instructor. Please ask them directly about all lab-related matters.

Calendar description

Biology 1050 | Introduction to Cell and Molecular Biology

Description	An introduction to the chemical, cellular and molecular processes that enable organisms to be alive. The definition of life; the scientific method; the chemistry of life; the structure and functions of cells; photosynthesis and cellular respiration; cell division and sexual reproduction; the functions of nucleic acids and proteins; and biotechnology in agriculture and medicine. Lecture concepts are reinforced through hands-on exercises in laboratory sessions.
Credit weight	0.5 FCE
Offering	3-3; 0-0
Notes	Students who have previous credit for Biology 1130 cannot take Biology 1050 for credit. An additional fee (see Miscellaneous Fees) is required for this course.
Course classification(s)	Type C: Engineering, Mathematical and Natural Sciences

Instructor's note: under "Offering", (a) "3-3" means 3 hours of lectures plus 3 hours of labs a week; (b) "3-3; 0-0" means that the course is offered in the fall term only; winter term courses will have numbers after the semicolon.

Important dates

Take note of the following important dates, as per the academic schedule of dates:

- Final date to add a course for 2024F: Mon. Sept. 16
- Final date to withdraw from a course without academic penalty (a/k/a drop date): Fri. Nov. 8
    - I 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.

LEARNING OUTCOMES

During this course, you will...

- improve and expand your critical understanding of major concepts in cell and molecular biology, including
    - diversity and evolution
    - development
    - reproduction
    - classification
    - biochemistry
    - ecology
- develop both hard and 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...

- use common biology terms
- use library resources to find scientific literature on biology
- recognize the properties common to all organisms
- understand how the control of chemical reactions is critical for organisms
- describe how the structure of cells allows them to regulate their metabolism
- identify the biochemical pathways in cells that allow them to obtain energy
- describe how plants use light energy to power life on Earth
- describe how cells reproduce by dividing their genetic and cytoplasmic material
- discuss how sexual reproduction is critical for evolution by natural selection
- outline how cells selectively translate DNA sequences into proteins
- describe the uses of biotechnology in agriculture and medicine

WHAT TO EXPECT IN CLASS

All of my lectures will be delivered in-person. Occasionally, I may teach via Zoom instead. I'll provide a link to the Zoom session in Calendar on the right hand side of the D2L course homepage.

Be courteous and participate

We should all try to be patient and kind to others during lectures. I appreciate feedback letting me know what does and doesn't work. Speak up right away so I 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.

Do the review questions in the breakout groups

I will end each lecture with some relevant questions. We'll answer these in breakout groups of around 4 to 6 students each. One person per group will answer their question. I'm not expecting perfect answers but want you to think about the questions and answers. While I do not mark your group's answers to the breakout question you are assigned in class, there's a good chance that similar questions will appear on the midterms and final exam, so participating in the breakout groups is excellent prep for doing well on the tests.

Attend lectures to receive participation marks

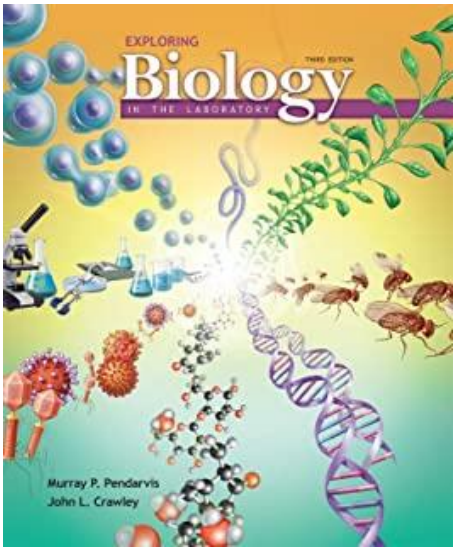
You have to be present during lectures to participate in the iClicker questions and receive participation marks. Also, attending class is key to getting a good grade.

LEARNING MATERIALS

Learning materials for this course include things you must buy and free internet resources.

Textbooks

- The laboratory manual ***Exploring Biology in the Laboratory***, Murray P. Pendarvis and John L. Crowley (third edition, 2018), Morton Publishing, Englewood, CO, USA. You can buy either the paper version or e-version.
    - Paper
        - Available from the Lakehead bookstore or elsewhere (i.e., at Amazon)
        - ISBN 978-1-61731-755-2
    - E-version
        - Available from Google Play to rent or buy.
        - Most of you will also use this lab manual next term in BIOL-1051: Intro to ecology and biodiversity and so you'll need to access it until the end of April; I thus recommend buying rather than renting.
        - eISBN-13: 9781617317569



We use an OpenStax textbook in the lecture portion of the course, which is online and free:

- ***Concepts of Biology***. Senior contributing authors Samantha Fowler, Rebecca Roush and James Wise (2021). Digital ISBN-13: 978-1-947172-03-6.

There is also a more advanced version of this textbook (also online and free) that we will occasionally consult, or for those who want to read a more advanced explanation of the concepts we cover in class:

- ***Biology 2e.***
  Senior contributing authors Mary Ann Clark, Texas Wesleyan University; Matthew Douglas, Grand Rapids Community College; Jung Choi, Georgia Institute of Technology

  Digital ISBN-13: 978-1-947172-52-4

iClicker

- The iClicker Student mobile app for your mobile device. When you install it, you'll be ready to participate and receive marks for the in-class polling that will start in the first class. See further info below for how this works under "Student participation".

LECTURE SCHEDULE

Following is a preliminary lecture schedule. Lecture slide stacks are generally available for download from D2L on the evening prior to the lecture.

The *CoB* readings (in green boxes below) are required; the *EB* (except where required for the labs) and *B2e* readings (slightly greyed out below) are optional.

Week starting Sunday...	**Topics**	**Reading** (chapter/section...)		
		Concepts of Biology	*Exploring Biology*	*Biology 2e*
Sept. 1	**Course welcome**			
	Introduction to biology; the scientific method	• 1	• 1	• 1
Sept. 8	"	"	"	"
	The chemistry of life	• 2	• 4 intro • 5 intro	• 2
Sept. 15	"	"	"	"
	Cell structure and function: cell theory; prokaryotes and eukaryotes; endosymbiosis	• 3.1 • 3.2 • 13.2	• 5 intro • 6 intro • 6.1 • 8 intro	• 4.1 • 4.2
Sept. 22	**Midterm #1: Wed. Sept. 25**			
	Eukaryotic cells	• 3.3	• 4.3	• 6.2 • 6.3 • 6.4
Sept. 29	**Membranes and transport**	• 3.4 • 3.5 • 3.6	• 8	• Intro • 5.1 • 5.2 • 5.3
	"	"	"	"
Oct. 6	**How cells obtain energy:** cellular respiration	• 4 intro • 4.1 • 4.2 • 4.3	• 10	• 7
	"	"	"	"

Oct. 13	**Lakehead fall study break (no classes)**			
Oct. 20	**Energy, metabolism and enzymes**	• 4.1	• 7	• 6.5
Oct. 27	**Photosynthesis:** how plants build the living world	• 5	• 9	• 8
	"	"	"	"
Nov. 3	**Midterm #2: Thurs. Nov. 2**			
	Reproduction at the cellular level: mitosis	• 6.1 • 6.2	• 11	• 10
Nov. 10	"	"	"	"
	The cellular basis of inheritance: sexual reproduction and meiosis	• 7.1 • 7.2	• 12	• 11
Nov. 17	"	"	"	"
	Molecular biology	• Chp. 9 Introduction • 9.1 • 9.2 • 9.3 • 9.4 • 9.5	• 14	• 14.2 • 14.3 • 14.5 • 14.6 • 15.1 • 15.3 • 15.4 • 15.5
Nov. 24	"	"	"	"
	Biotechnology	• Chp. 10 introduction • 10.1	• 15	• Chp. 17 introduction • 17.1 • 17.3 • 17.4 • 17.5
	Final exam review			

See your lab schedule and content at the BIOL-1050-FO1 D2L site.

MARKING SCHEME

- Midterm exam 1: **15%**
- Midterm exam 2: **20%**
- Final exam: **20%**
- Course participation: **5%**
- Labs (more details in lab D2L site): **40%**

STUDENT PARTICIPATION

You'll participate during class using the **iClicker Student** app for your smartphone/tablet/laptop/other device. Buy it in either the Android or iOS app store and install it on your device.

Then link it to the course by either

- Using this join code, or
- Searching for my name at the **Lakehead University-Orillia** campus and choosing **BIOL-1050-FAO: Intro to cell and molecular biology**.

The cost is around CAD 22 for a 6-mo subscription.

Bring either your device with the app on it to each class. You will use it to answer questions and receive participation marks.

Previously, some students have asked me to choose a free polling app (e.g., the basic version of Top Hat; Kahoot!; Zoom polling) rather than a paid version. I have researched many of them and found that iClicker Student best meets my and your need for participation tracking, user friendliness and reliability.

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

- attendance (2.5%), and
- correct answers (2.5%).

Therefore, to receive a high participation mark, you have to be both physically and mentally present in class.

You may miss 2 lectures without penalty to your participation mark. For example, if there are 20 classes where we vote with iClicker, you need to be present for 18 of these to receive full credit for attendance.

I'll give you some additional information on the technology in the first class.

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 2023F. The comments are complete and unedited (except for spelling and grammar).

The requests for changes from 2023F were:

- **Make the class longer.** Sorry, I can't 🙂
- **Align the lab and lecture material better.** I rearranged the lecture material this year to better synchronize to what you're learning in the lab. Tell me if I was successful when you complete the SFT in late November.
- **Include group projects.** There are a few opportunities for working in a group in class and lab, so I will try to do more of those this year.

Marks

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

- Average score = 4.67 / 5
- Standard deviation +/- 0.20
- Number of survey participants = 7 out of 22 total students

Comments

What did you like about this course?

- This course was an elective for me, but I enjoyed the challenges and the professor was very enthusiastic about concepts and learning, it made class fun. The iclicker sessions were a great addition for participation, and it opened opportunities for further discussions on topics that may not have been as clear. Overall, really enjoyed this course, it is designed perfectly for both knowledgable learners, and beginner learners in biology.
- Playdoh, mock exams, and bananas.
- Dr. Menon was amazing and passionate about her work. Labs were clear and easy, pre-lab quizzes were nice, since we had less pressure.

- I liked having three exams instead of just a midterm and a final.
- Pretty great honestly. All I wanted out of it.
- I really enjoyed not only the content of the course, but the encouragement for participation from Dr. Law. I really like the iclicker questions and I found that it not only encouraged students to participate, but it really helped to follow along with the lectures and actually understand the material and think about it rather than just reading the slides and moving on. I also really liked the setup of the tests, and how there are multiple different types of questions. Another thing I found helpful that not all instructors do is the zoom review sessions. Those sessions encouraged me to complete the mock exam on time, and I found that they really helped me understand where I may have went wrong with some questions and helped me better prepare for the exams. Dr. Law also has a very stimulating way of teaching, I never felt bored attending the lectures and I actually looked forward to them most days. I like that he keeps the class engaged by asking what we think for certain questions, and mentions numerous examples to try and better our understanding. Overall I really enjoyed not only the course but how it was taught and all the extra resources such as mock exams, modelling answers to questions with play dough, and the group discussion questions at the end of each lecture.
- I enjoyed the course content and the various ways students were encouraged to participate in class.

What suggestions do you have for improving this course?

- Suggestions about course improvement were already applied after the first midterm and made the content easier to digest. I believe the suggestions were to go over more basic concepts to help draw connections and basic review.
- Make the classes longer!
- group-based projects? maybe? I like learning like that personally.
- I think that the course is very well set up and the labs complemented the lectures, so there really isn't anything in particular I could suggest.
- I do not have any suggestions at this time.

Additional Comments

- Dr. Menon's lab was just as enjoyable. It included relevant and easy to do labs. I do wish the two classes blended a bit better and followed the same timeline to help deepen understandings of topics. For example, both classes / lectures to go over cellular respiration within the same week.
- You're a great prof. I felt like you really listened to the class on what worked for us and adjusted accordingly. I also really appreciated that you didn't rush through the course material just to fit everything in before the end of the semester.

- I also just wanted to mention that the lab instructor Usha is great as well. She keeps the class engaged in the prelab talks and her prelab quizzes not only help with understanding the lab portion of the course but for the in class lectures as well. The labs complemented the lectures very well and I think everyone seemed to enjoy them. The lab exams also incorporated aspects from the labs, but from the lectures too, allowing you to really make the connections to the things we talked about in class.

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

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 using the iClicker Student app.

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.