MOLECULAR GENETICS
APBI/BIOL 3135

COURSE OUTLINE Fall 2024

Instructor

Dr. Heidi Schraft
Biology, CB4015
Phone: 807-343-8010 Ext. 8351
Email: please contact me through the **email link on the D2L course page**.

Office Hours

Tue and Thu 1 pm - 2 pm
My office is at the TB campus, in the Centennial Building, room CB 4015

I aim to be in my office during the above office hours. However, occasionally, I may need to attend other meetings during these times and will not be available. Therefore, **I recommend booking an appointment for a meeting** here. I may add appointment slots at additional times, and you are more than welcome to book any of these.

Students at the Orillia campus can book an appointment for a Zoom meeting here.

Laboratory Instructors

Thunder Bay:
Christina Richard
Email: crichar3@lakeheadu.ca

Orillia:
Dr. Usha Menon
Email: umenon@lakeheadu.ca

Lectures and Tutorial

Lectures:
	Tue and Thu 10:00 am – 11:30 am
	Lectures are in person via Telepresence.
	TB students attend in AT 5041
	OR students attend in OA 2020

Laboratory:
	TB Wed 2:30 pm – 5:30 pm, CB 3012
	OR Fri 11:30 pm – 2:30 pm, OA 3002

Textbook

Snyder & Champness Molecular Genetics of Bacteria, 5th edition

by Henkin, T. and Peters, J.; published by Wiley and ASM Press.

>The 4th edition is oK as well.

>You can buy an eBook or a hardcopy in the Lakehead University bookstore.

The 4th edition is available on reserve in the library.

There will be required reading from the book. I strongly recommend that you have a book available to you throughout the semester.

Learning Objectives

- Discuss prokaryotic DNA structure, organization and replication (chromosomal DNA and plasmid DNA) with emphasis on molecular mechanisms, replication impediments and coordination of DNA replication with chromosome segregation.
- Describe gene expression at the molecular level with emphasis on promoters, translation initiation and termination, *cis & trans*-acting factors, and polar effects of translational coupling.
- Discuss the molecular mechanisms of gene transfer by conjugation, transformation and transduction. Describe gene transfer experiments and evaluate their data to map genes.
- Describe properties of transposons found in bacteria and explain transposition at the molecular level.
- Describe, compare and contrast site-specific and homologous recombination, with emphasis on molecular mechanisms and discuss their applications in molecular biology research.
- Discuss DNA damage, spontaneous and induced mutations in bacteria and explain their effects on gene expression. Describe prokaryotic responses to DNA damage and mutations. Explain how mutagenesis can be used to understand gene function and metabolic pathways.
- Discuss specific and global regulation of gene expression in bacteria. Examine examples of transcriptional, translational and posttranslational gene regulation and explain the functions of selected regulons and stimulons.
- Apply molecular biology techniques and bioinformatics tools to clone, sequence and examine the GAPDH gene from a plant.

Please refer to the lecture schedule on page 8 for topics covered and to the study guides posted in Desire2Learn (D2L) for each topic's detailed Learning Objectives.

Performance Evaluation

Activity	Weight
Class Participation Each class: iClicker Occasionally: brief D2L quiz or assignment	7.5%
Laboratory	30%
Mid-term tests Test #1: Thu Oct 3, 2024 Test #2: Tue Nov 12, 2024	30% (2 x 15%)
Final exam (cumulative) During exam period	32.5%
Total	100%

Please note that all tests and the final exam will be in person.

DESIRE2LEARN – D2L

You will have access to a course page through Desire2Learn (D2L) where you'll find course updates, lecture slides, assignments, links to selected websites, etc.

To log into your course website:
1. Go to https://mycourselink.lakeheadu.ca/d2l/home
2. Enter your Login/ID (your Lakehead University e-mail username) and your Password/PIN number.
3. Click on the course title to enter the course.

If you encounter any difficulties logging into the course site, please contact:
mycourselink@lakeheadu.ca

iClicker

I will be using iClicker to make our class time more engaging. This will help me understand what you know, give everyone a chance to participate, and increase how much you learn in class. It will also provide feedback on how well you comprehend course content, help you master challenging concepts, and allow you to review material after class.

Participating in iClicker sessions will be counted towards the participation component of your final grade. It will be worth 7.5% of your final grade. You will earn 1 point for each correct answer to a question and 0.5 points for each incorrect answer. Likely, 3 - 5 questions will be asked in a 1.5-hour lecture period.
For the final iClicker grade calculation, I will drop the two lowest marks. We will start using iClicker in the first week of classes; however, only sessions after the last day to add a course will be counted towards the iClicker grade. I may assign bonus points for iClicker work until the last day to add a course.

You are required to bring a device to participate in the iClicker sessions during class. I will allow participation with the iClicker **student app on a smartphone, tablet or laptop**. It is your responsibility to set up your iClicker account in a timely fashion and register for my iClicker course. You are responsible for regularly checking your iClicker records for any discrepancies and bringing them to my attention within 48 hours.

To participate in my iClicker activities and ensure that your grades are properly reflected in the grade book, please register for iClicker by following the steps listed at the end of this syllabus (page 10)

Missed Exams, Late Assignments and Extensions

I have limited capacity to accommodate missed exams, late assignments or extensions.

- If you **miss a mid-term test**, you may only write a make-up test if you **inform me before the test** and **provide an acceptable supporting explanation within 48 hours of the missed test**. Information about the steps to follow when missing a test or exam due to illness or other extenuating circumstances can be found here.
- 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.
- If you miss the final exam, you must follow the protocol required by Enrolment Services. You can find it in the Calendar: University Regulations (scroll to Section IV Examinations)

However, if you run into *time constraints or other difficulties during the semester, I encourage you to contact me* (please use the D2L email for this), and I will work with you to find a solution.

Accommodation for Disabilities

Lakehead University is committed to achieving full accessibility for persons with disabilities/medical conditions. Part of this commitment includes arranging academic accommodations for students with disabilities/medical conditions to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability/medical condition and think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please email sas@lakeheadu.ca or visit https://www.lakeheadu.ca/faculty-and-staff/departments/services/sas

Academic Integrity

A breach of Academic Integrity is a serious offence. The principle of Academic Integrity, particularly of doing one's own work, documenting properly (including use of quotation marks, appropriate paraphrasing and referencing/citation), collaborating appropriately, and avoiding misrepresentation, is a core principle in university study. Students are strongly advised to familiarize themselves with the Student Code of Conduct - Academic Integrity ("The Code") - and, in particular, sections 26 and 83 through 85. Non-compliance with the Code will NOT be tolerated in this course and the Code will be adhered to in terms of disciplinary action. The Code provides a full description of academic offences, procedures when Academic Integrity breaches are suspected and sanctions for breaches of Academic Integrity.

I will not grade any of your work unless you have submitted the AIM Certificate or the AIM Refresher Certificate, <u>dated September 2024</u>. Please refer to the D2L course site for additional information.

Exam/Assignment Integrity

I understand and agree that:

(a) Unless otherwise allowed by the course instructor, I must complete the assignments in this course without the assistance of anyone else.
(b) Unless otherwise allowed by the course instructor, I must not access any sources or materials (in print, online, or in any other way) to complete any course exam.
I further understand and agree that, if I violate either of these two rules, or if I provide any false or misleading information about my completion of course assignments or exams, I may be prosecuted under the Lakehead University Student Code of Conduct – Academic Integrity, which requires students to act ethically and with integrity in academic matters and to demonstrate behaviours that support the University's academic values.

Generative AI Policy

GenAI Use Permitted

Generative artificial intelligence (Generative AI or GenAI) is a category of AI systems capable of generating text, images, or other media in response to prompts. These systems include ChatGPT and its variant Bing (built by OpenAI) and Bard (built by Google) among several others. Other generative AI models include artificial intelligence art systems such as Stable Diffusion, Midjourney, and DALL-E.

GenAI tools can provide valuable assistance and support in academic work. However, it is essential to use them responsibly and ethically. The following information and guidelines apply to the use of AI-based tools in this course:

Student Responsibility – It is the responsibility of the student to understand the limitations of AI-based tools. While these tools can provide suggestions and insights, final decisions and critical thinking should come from the student's own understanding and effort. Before submitting, review your work with this in mind. If you don't understand what type of GenAI usage is appropriate, ask the course instructor for clarification.

Formative Usage – In this class, you may use GenAI for formative, but not summative, work. That means it can be used as a "possibility engine" (brainstorm tool), a "study buddy," a "collaboration coach," a "guide on the side," a "personal tutor," a "co-designer," etc. to help you learn course content, but it cannot be used as the primary vehicle for any work that is submitted for marks or evaluation. (See UNESCO's "ChatGPT and Artificial Intelligence in Higher Education Quick Start Guide," page 9, for explanations and examples of these and other roles GenAI can productively serve in a formative capacity.)

Error & Bias – AI content is created by computer algorithms that have been trained using large amounts of data. The AI learns from patterns and examples in the data to generate new content that resembles what it has been trained on. If the training data used to train the AI model is biased or limited in scope, the AI may reproduce content that is inaccurate, incomplete, offensive, and/or biased. Students should weigh this as they consider material produced by AI.

Trustworthiness – Generative AI can be vulnerable to manipulation and misuse. It can be used to generate fake news, misinformation, or deepfake content, which can have harmful consequences. Students should check AI generated content against reputable sources.

Plagiarism – Since [writing and critical thinking ability] are learning outcomes of this course, all work submitted for evaluation must be the student's original work. Using the work of others (including content curated/generated by AI) without proper citation is considered plagiarism. See "Citing Artificial Intelligence" for assistance with correct documentation.

Citation of Sources – If you use material generated by an AI program for an assignment in this course, it must be cited like any other source (with due consideration for the quality of the source, which may be judged as poor). Failure to do so will be considered a violation of academic integrity. See Student Code of Conduct – Academic Integrity.

Notice regarding Copyright

By accessing materials of APBI/BIOL-3135, you agree to the following Copyright Compliance:

I understand and agree that all instructional, reference, and administrative materials to which I am given access in this course (the "course materials"), whether they consist of text, still or kinetic images, or sound, whether they are in digital or hard copy formats, and in whatever media they are offered, are protected in their entirety by copyright, and that to comply with this copyright and the law.

(a) I may access and download the course materials only for my own personal and non-commercial use for this course; and

(b) I am not permitted to download, copy, store (in any medium), forward or share, transmit, broadcast, show, post or play in public, adapt, or change in any way any text, image, or sound component of the course materials for any other purpose whatsoever except as expressly authorized, and only to the extent authorized, in writing, by the course instructor.

I further understand and agree that, if I infringe the copyright of the course materials in any way, I may be prosecuted under the Lakehead University Student Code of Conduct – Academic Integrity, which requires students to act ethically and with integrity in academic matters and to demonstrate behaviours that support the University's academic values.

Notice for Recording Lectures and Class Activities

In APBI/BIOL-3135, instruction in the classroom may be recorded for confidential access by students registered in the course but who are unable to attend class due to the pandemic or other necessity. To the greatest extent possible only the image and voice of the instructor will be recorded for this purpose but, due to class interaction, the images and voices of students present in the classroom may be incidentally recorded and, thus, be available for access by course students in remote locations. These recordings, however, are strictly confidential and may be used only by the instructor and students registered in the course and only for purposes related to the course. They may otherwise not be used or disclosed. Students in the classroom who are concerned about being recorded in this fashion may request the instructor to exclude them from the recording to the greatest degree possible on the understanding that total exclusion cannot be guaranteed. The recordings are made under the authority of sections 3 and 14 of The Lakehead University Act, 1965. Questions about the collection of the images and sounds in the recordings may be directed to the Acting Chair of Biology (Dr. M. Rennie, email mrennie@lakeheadu.ca, telephone 807-343-8010 Ext. 7860).

Lecture Schedule – APBI/BIOL 3135 Fall 2024

Week	Date	Topic	Important Dates
1	Sep 1 - 7	The bacterial chromosome and bacterial gene expression: Chapters 1 & 2	
2	Sep 8 - 14		*Sep 16: Last day to add*
3	Sep 15 - 21	Bacterial genetic analysis: Chapter 3	*Starting this week, iClicker will count*
4	Sep 22 - 28	Bacterial genetic analysis: Chapter 3 Plasmids: Chapter 4	
5	Sep 29 – Oct 5	Plasmids and Conjugation: Chapters 4 and 5	**Thu Oct 3: Test #1**
6	Oct 6 - 12	Conjugation and gene mapping with Hfr: Chapter 5	
	Oct 13 - 19	Study week	
7	Oct 20 - 26	Transformation, Transduction and gene mapping: Chapters 6 and 7	
8	Oct 27 – Nov 2	Transposition and site-specific recombination: Chapter 8 Intro Homologous Recombination: Chapter 9	
9	Nov 3 - 9	Homologous Recombination: Chapter 9 DNA repair and mutagenesis: Chapter 10	*Nov 8: last day to drop*
10	Nov 10 - 16		**Tue Nov 12: Test # 2**
11	Nov 17 - 23	Regulation of gene expression – genes, operons, regulons and stimulons: Chapters 11 & 12	
12	Nov 24 - 30		

Tue Dec 3 – No class for Molecular Genetics. This is the make-up day for Sept 30.

Laboratory Schedule APBI/BIOL 3135 – Fall 2024

Date (TB / OR)	Experiments and Lab Manual Reference	Tests and Materials Due
Sept 4 / 6	Lab Overview, Lab Safety and Gel Doc Training	
Sept 11 / 13	DNA Extraction and Initial PCR (Ch. 1 & 2)	Pre-Lab Quiz Focus Questions (Ch. 1) Assignment #1
Sept 18 / 20	Nested PCR (Ch. 2) Prepare Broth and Plates for Transformation (App. A)	Pre-Lab Quiz
Sept 25 / 27	Pour Agarose Gels (App. A) Electrophoresis and Purification of PCR Products (Ch. 3 & 4)	Pre-Lab Quiz Focus Questions (Ch. 2, 3, 4)
Oct 2 / 4	Ligation and Transformation (Ch. 5 & 6)	Pre-Lab Quiz Focus Questions (Ch. 5 & 6) Assignment #2
Oct 9 / 11	Plasmid Purification (Ch. 7) Pour Agarose Gels (App. A)	Pre-Lab Quiz Focus Questions (Ch. 7)
Oct 23 / 25	Gel Electrophoresis of Plasmid Purification (Ch. 7) Prepare Sequencing Reactions (Ch. 8)	Pre-Lab Quiz Focus Questions (Ch. 8)
Oct 30 / Nov 1	No Lab: Wait for Sequencing Results	
Nov 6 / 8	No Lab: Wait for Sequencing Results	
Nov 13 / 15	Bioinformatics of Sequence Data (Ch. 9)	Pre-Lab Quiz Focus Questions (Ch. 9) Assignment #3
Nov 20 / 22	No Lab	
Nov 27 / 29	No Lab	Assignment #4

Breakdown of Laboratory Grade (worth 30% of course grade)

Description	Value
Pre-Lab Quizzes	5.6%
Focus Questions	7.1%
Lab Assignments	10.3%
Lab Notebook	6%
Laboratory Performance and Preparedness	1%

iClicker – Steps for Registration

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To participate in my iClicker activities and ensure that your grades are properly reflected in the grade book, please register for iClicker by following the steps below.

1. **Go to join.iclicker.com**
   - Enter the code to join this course: **XHXS**
   - **You can also join through this link: https://join.iclicker.com/XHXS**

2. **Sign in if you already have an iClicker account, or create a new account.**
   - **If you already have an account:** DO NOT create a new one. You can only receive credit from one account.
   - **If you are creating a new account:** Make sure you enter your name and email exactly as they appear in **Lakehead University account**.
   - In the **"Student ID"** field, add the **username of your lakeheadu email** (the name before @lakeheadu.ca)
   - I will not use iClicker remotes in this course.

3. **You should be dropped directly into this course: APBI/BIOL 3135FA/FAO Molecular Genetics F2024.**
   - If you don't see this course in your account, use the **+** sign to search for my course:
     - In the "Find Your Institution" field, enter **Lakehead University-Thunder Bay** *Note that Orillia students will also use the Thunder Bay location because an iClicker course can only have one location.*
     - In the "Find Your Course" field, enter **APBI/BIOL 3135FA/FAO Molecular Genetics F2024.**
     - Select "Add This Course" and it will be added to the main Courses screen of your iClicker account.

4. **Download the iClicker App and purchase an iClicker subscription to participate in class.**
   - Upon signing up with iClicker, you will have a two-week free-trial period for using the app to participate in class activities. **Before the free trial ends,** you need to purchase an iClicker subscription to continue participating in class with iClicker on your mobile device, tablet, or laptop. iClicker will let you know when your free trial is ending. If your free trial ends without completing this step, you will be unable to participate in class activities until you purchase a subscription or enter an access code.

5. **Set up the device you'll use to participate in my class sessions.**
    - You can download the iClicker student mobile app via the App Store or Google Play, or you can use the iClicker web app by signing in as a student at iclicker.com.
        - Connect to our classroom's Wi-Fi:
          The wireless network you should use in our classroom is the **Lakehead University Wifi.**

6. **Now the fun part! Participate in my class activities.**
    - When it's time for class, make sure you have selected my course from the main screen of your iClicker account.
        - When I start a session, select the **Join** button that appears on your screen, then answer each question I ask in iClicker.
        - For short answer, numeric, and target questions, make sure you select **Send**.

7. **Review your work, and study after class in iClicker.**
    - You can review your grades, performance, and participation in iClicker.
    - You can bookmark the questions I asked during class to turn them into flashcards or practice tests in the Study Tools section of iClicker.

Academic Integrity Information

iClicker activities fall under the provisions of our campus academic honesty policy. Students must not engage in academic dishonesty while participating in iClicker activities. This includes but is not limited to:

- Checking in while not physically in class
- Having another student check you into class
- Answering polling questions while not physically in class
- Looking at other students' devices while answering live questions
- Using more than one iClicker remote or account at a time

Any student found to violate these rules will lose their iClicker points for the entire term and may be reported to the Office of Student Conduct.

Need help with the iClicker student app?
- If you are having trouble with your iClicker access code, check out this guide to access code errors.
- If you are having issues connecting to the iClicker student app, check out these iClicker Connectivity Tips.
- If you are having issues seeing your iClicker points, check out this troubleshooting guide.
- Find answers to other questions and contact the iClicker Tech Support Team by visiting iclicker.com/support at any time.