Molecular Genetics
Department of Biology
Winter Term

Instructor Information

Instructor: Dr. Qianshi Lin
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Office Hours: CB4015 10:30 to 11:30 Tuesday and Thursday. *Otherwise by appointment*

Laboratory Instructors Information:

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Course Identification

Course Number:	APBI/BIOL 3135
Course Name:	Molecular Genetics
Lecture Location:	AT 5041 (TB students)/OA2020 (OR students)
Lecture Times:	Monday Wednesday 17:30 to 19:00
Laboratory:	**TB** Thursday 8:30 am – 11:30 am, CB 3012
	OR Thursday 2:30 pm – 5:30 pm, OA 3002

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.

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 ($136.95) or a hardcopy ($189.95) in the Lakehead University bookstore.
The 4th edition is available on reserve in the library.

I strongly recommend that you have a book available to you throughout the semester.

Course Schedule/ Lecture Outline*

Date(week of)	Tentative Topic	Important Dates
Jan 5	The bacterial chromosome and bacterial gene expression: Chapters 1 & 2	
Jan 12		
Jan 19	Bacterial genetic analysis: Chapter 3	
Jan 26	Bacterial genetic analysis: Chapter 3 Plasmids: Chapter 4	
Feb 2	Midterm test 1 Plasmids and Conjugation: Chapters 4 and 5	Feb 2: Midterm test 1
Feb 9	Conjugation and gene mapping with Hfr: Chapter 5	
Feb 16	Winter Reading Week	
Feb 23	Transformation, Transduction and gene mapping: Chapters 6 and 7	
Mar 2	Transposition and site-specific recombination: Chapter 8 Intro Homologous Recombination: Chapter 9	

Mar 9	Homologous Recombination: Chapter 9 DNA repair and mutagenesis: Chapter 10	
Mar 16	Midterm test 2 Regulation of gene expression – genes, operons, regulons and stimulons: Chapters 11 & 12	Mar 16: Midterm test 2
Mar 23		
Mar 30		
	Final exam. TBA	

***subject to change at the discretion of the instructor**

Laboratory Schedule:

Date	Experiments and Lab Manual Reference	Tests and Materials Due
Jan 8 Lab 1	Lab Overview, Lab Safety and Gel Doc Training	
Jan 15 Lab 2	DNA Extraction and Initial PCR (Ch. 1 & 2)	Pre-Lab Quiz Focus Questions (Ch. 1) Assignment #1 due
Jan 22 Lab 3	Nested PCR (Ch. 2) Prepare Broth and Plates for Transformation (App. A)	Pre-Lab Quiz
Jan 29 Lab 4	Pour Agarose Gels (App. A) Electrophoresis and Purification of PCR Products (Ch. 3 & 4)	Pre-Lab Quiz Focus Questions (Ch. 2, 3, 4)
Feb 5 Lab 5	Ligation and Transformation (Ch. 5 & 6)	Pre-Lab Quiz Focus Questions (Ch. 5 & 6) Assignment #2 due
Feb 12 Lab 6	Plasmid Purification (Ch. 7) Pour Agarose Gels (App. A)	Pre-Lab Quiz Focus Questions (Ch. 7)
Feb 26 Lab 7	Gel Electrophoresis of Plasmid Purification (Ch. 7) Prepare Sequencing Reactions (Ch. 8)	Pre-Lab Quiz Focus Questions (Ch. 8)
Mar 5	No Lab: Wait for Sequencing Results	
Mar 12 Lab 8	Bioinformatics of Sequence Data (Ch. 9)	Pre-Lab Quiz Focus Questions (Ch. 9) Assignment #3 due
Mar 19	No Lab	
Mar 26	No Lab	Assignment #4 due

Assignments and Evaluations

Item	Value
Mid term test 1&2	40% (2 x 20%)
Final exam	30%

Laboratory	30%
Total	100%

Assignments

All assignments will be distributed during your scheduled lab time. Written instructions will be provided during the lab time as well as on the D2L (myCourselink) site.

Late Assignments

Term tests must be written on the designated date, in class, unless prior arrangements are made with the instructor or a doctor's note is provided. Late assignments will lose 10% of the designated mark, per day (holidays and weekends included). Presentations must be completed on the assigned day unless prior arrangements have been made.

Course Policies

- Students are expected to adhere to the Lakehead University code of student behavior and disciplinary procedures (The code): Code of Student Behaviour and Disciplinary Procedures

Regulations

"It is the responsibility of each student registered at Lakehead University to be familiar with, and comply with all the terms, requirements, regulations, policies and conditions in the Lakehead University Academic Calendar. This includes, but is not limited to, Academic Program Requirements, Academic Schedule of Dates, University and Faculty/School Policies and Regulations and the Fees and Refund Policies and Schedules."

Collaboration/Plagiarism

While cooperative learning is encouraged, academic misconduct (including plagiarism) is strictly forbidden. All tests and assignments are to be completed individually unless explicitly stated otherwise. The penalty for plagiarism is a null grade on the assignment and will be reported to the department.

Plagiarism is defined in University Regulation IX with additional examples in Article I, Section 1 of The Code. Sanctions associated with Academic Misconduct are defined in Article II of The Code and Enforcement Procedures are outlined in Article III of The Code.

Students wishing to learn more about Academic Misconduct are encouraged to read the University and relevant Faculty Regulations and The Code (noted above) and access other resources on the Teaching Commons website.

Any use of GenAI systems to produce assignments for this course is not permitted. All work submitted for evaluation in this course must be the student's original work. The submission of any work containing AI generated content will be considered a violation of academic integrity.

University Policies – all University Policies can be found here. Pay particular attention to those found under the Category of "Regulations" and "Student-Related". If you have a question, please let me know by email or in-class. If you have a question, it is likely that at least a few others in the class are wondering the same thing.

Supports for Students – there are many resources available to support our students. These include but are not limited to:

- Health and Wellness
- Student Success Centre
- Student Accessibility Centre
- Library
- Academic Support Zone (Writing and Math Tutoring Centre)

Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities and/or 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 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 contact Student Accessibility Services http://studentaccessibility.lakeheadu.ca (SC0003, 343-8047 or sas@lakeheadu.ca)

Additional Information

Course Fees

- none

Course Supplies

- none