

COURSE SYLLABUS



COURSE TITLE: CHEMISTRY 250 - Molecular Biotechnology

CLASS SECTION: 001

TERM: 2025W

COURSE CREDITS: 3

DELIVERY METHOD(S): In Person

Camosun College campuses are located on the traditional territories of the Ləkʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.

Learn more about Camosun's [Territorial Acknowledgement](#).

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable explanation in advance, you will be removed from the course and the space offered to the next waitlisted student.

INSTRUCTOR DETAILS

NAME: Armando Jardim, Ph.D.

EMAIL: jardima@camosun.ca

OFFICE: F348D, Fisher Building, Lansdowne Campus

HOURS: Monday 8:30-9:20, Tuesday 9:30-10:30, Wednesday 2:30-3:30, Friday 9:30-10:30

LECTURES:

Tuesday 2:30 – 3:20 pm Fisher 214

Thursday 2:30 – 3:20 pm Fisher 214

LABORATORY:

Monday 9:30 – 1:20 pm in F360 (**Laboratory component – compulsory attendance**)

Feel free to contact me by email, including in the evenings and on weekends, to correspond by email or to arrange an appointment.

As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.

CALENDAR DESCRIPTION

CHEM-250 Molecular Biotechnology: This course covers fundamentals of molecular biotechnology and applications to drug, vaccine and diagnostics development with emphasis on medical biotechnologies, industrial processing and agrobiotechnology. Topics include: gene expression systems, protein engineering, targeted tissue delivery, gene therapy, DNA diagnostics, recombinant DNA vaccines, fermentation, and bioremediation.

PREREQUISITE(S):

- Chemistry 255

CO-REQUISITE(S):

- Chemistry 255

COURSE LEARNING OUTCOMES / OBJECTIVES

1. Compare and align their relevant fundamental knowledge of biochemistry and microbiology with the applications of molecular biotechnology platform in the medical, veterinary, agricultural and environmental sectors of the biotechnology industry.
2. Evaluate the basic significance and future potential of molecular biotechnologies in clinical and veterinary medicine, laboratory and field-based diagnostic testing, nutrition and agriculture, and environmental biotechnology.
3. Obtain the basic vocabulary of molecular biotechnology.
4. Compare and contrast competitive diagnostics or therapeutics.
5. Compare and contrast small-scale and large-scale gene expression systems.
6. Have hands-on experimental skills that are fundamental to the utilization of recombinant DNA technology.
7. Evaluate experimental design, design control experiments, and interpret data arising from basic recombinant DNA technologies.
8. Conduct fundamental, computer-based analyses of DNA and protein sequence data using databases and programs available via the internet.
9. Work in a level-1 biosafety laboratory.
10. Prepare, handle and store many types of biochemical reagents and buffers.
11. Properly maintain a laboratory notebook as a verifiable record of experimental work.
12. Compare the various forms of intellectual property protection relevant to the molecular biotechnology industry.
13. Outline the variety of potential career paths in molecular biotechnology industries.

REQUIRED MATERIALS

Course Textbooks:

Fundamentals of Biochemistry, Life at the Molecular Level. Sixth Edition

VOET, D., VOET, J., PRATT, C.W., HEILMAN, D., and WOSKI, S. (2024) 6^{ed} WILEY.

Molecular Biotechnology: Principles and Applications of Recombinant DNA. Glick, B.R. & Patten, C.L. (2017) John Wiley & Sons.

This textbook is required for this course. It may be purchased from the Lansdowne Campus bookstore. Chapter study guides are included in the course pack also containing the laboratory manual (please see below). Links to relevant web-based learning resources are presented in the textbook. A collection of relevant lecture slides, largely based on this textbook, are available as a separate course pack (please see below).

Chem 250 Laboratory Manual.

This course pack contains experimental procedures with introductory material that, along with the textbook, provide an understanding of the biochemical techniques employed in the laboratory component of the course. This required material is available through D2L.

Chem 250 Lecture Slides Course Package.

This required material has proven to be vital in promoting optimal lecture-based learning, in-class discussion, and salient notetaking. The course powerpoint slides can be downloaded from D2L.

Safety glasses

Safety glasses are required when handling hazardous chemicals, and are recommended when handling laboratory glassware. Each student is required to provide her or his own pair of safety glasses. Students lacking safety glasses when they are required will not be permitted in the laboratory. Prescription glasses will suffice.

Lab coats

Lab coats are required for all experimental work in the laboratory. Each student is required to provide her or his own lab coat.

Disposable plastic gloves

Disposable, plastic, 'non-allergenic' gloves will be available in the laboratory and are to be used when appropriate to protect the skin from potentially hazardous chemicals or to protect biochemicals from degradative enzymes found on the skin.

Calculator

A scientific calculator is required at times in the laboratory, in lecture, and during term tests and the final exam. Each student is required to provide her or his own calculator. Cell phone-based, tablet-based or computer based calculators, or graphing calculators, cannot be used during term tests or the final exam.

Laboratory Notebook

A blue hardbound notebook (A91) is required for the course

COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor.

Chapter(s)	Lecture Topic	Chapter(s)	Lecture Topic
1	Introduction to Biotechnology	5	Bioinformatics
2	Review: DNA & Gene Structure, Function & Regulation	9-11	Diagnostics & Therapeutics
3	Recombinant DNA Technology	13-17	Microbial Biotechnology
6-7		18-20	Plant Biotechnology
8		21	Transgenic Animals
4	DNA Synthesis, Amplification & Sequencing	22-23	Biotechnology & Society

WEEK or DATE RANGE	ACTIVITY or TOPIC	OTHER NOTES
Week 1 Jan 6-10	Introduction to Biotechnology	
Week 2 Jan 13-17	Review: DNA & Gene Structure, Function & Regulation	
Week 3 Jan 20-24	Recombinant DNA Technology: Molecular Cloning	
Week 4 Jan 27-31	Purification of Nucleic Acids: Isolating Plasmid DNA	

WEEK or DATE RANGE	ACTIVITY or TOPIC	OTHER NOTES
Week 5 Feb 3-7	Characterization of purified Plasmid DNA	
Week 6 Feb 10-14	Agarose Gel Electrophoresis and Fragment analysis	
Week 7 Feb 17-21	Family Day and Reading Break	
Week 8 Feb 24-28	Restriction Endonucleases - Molecular Biology Techniques	
Week 9 Mar 3-7	DNA Modifying Enzymes	
Week 10 Mar 10-14	Methods for DNA Delivery	
Week 11 Mar 17-21	DNA Sequencing Technologies	
Week 12 Mar 24-28	Gene Structure and & Regulation of Transcription	
Week 13 Mar 31- Apr 4	Vectors for Prokaryotic and Eukaryotic Gene Expression	
Week 14 Apr 7-11	Recombinant Proteins Expression and Purification	
	Final Exam The date & time of the final exam will be posted by the College during the 2025W semester.	

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced notice is required. Deadlines can be reviewed on the [CAL exams page](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

Laboratory Outline

Some lab activities will be conducted over multiple lab periods.

I. Introduction to the Biotechnology Lab

- Orientation, laboratory safety, biosafety
- Keeping a research laboratory notebook
- Good micropipetting technique

II. 'Mini-prep' isolation of plasmid DNA (two methods)

- Rapid, small-scale isolation of plasmid DNA from *E. coli* using the Birnboim and Doly Alkaline Lysis Method.
- Rapid, small-scale isolation of plasmid DNA from *E. coli* using the QIAGEN mini-prep spin 'columns'.
- Agarose gel electrophoresis of purified plasmid DNA.
- DNA staining, UV-transillumination and photography.

- Analysis of plasmid DNA morphologies, and general analysis of AGE results.
- A_{260nm} -based DNA quantitation.

III. DNA Subcloning

- Restriction enzyme digestion of vector and target DNA.
- DNA ligation to form recombinant plasmids.
- DNA transformation of competent bacteria.
- Plating of bacterial cells on antibiotic-containing medium to select for isolated colonies of transformed cells.
- Use of colorimetric, enzymatic, insertional gene-inactivation assay to visually select recombinant plasmids (blue-white selection).

IV. Physical Mapping of DNA

- Single- and double-restriction enzyme digestion.
- Molecular weight/size determination of linear DNA fragments using agarose gel electrophoresis.
- Physical mapping of DNA fragments by data analysis.

VI. DNA Amplification by the Polymerase Chain Reaction

- PCR analyses of cloned DNA fragments from recombinant clones.
- Optimization of PCR.
- Agarose gel electrophoresis analysis of amplified DNA to determine sizes of amplified, cloned DNA fragments.

VII. Bioinformatics: Computer Analyses of DNA and Protein Sequences

- Application of BLASTN, BLASTX, and similar software packages to analyze sequences by comparison to worldwide DNA and protein databases
- Analysis of open reading frames (ORF's) for consensus sequences for transcription and translation (dependent on available software)
- Comparative protein sequence analyses by CLUSTAL W & similar software.

EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Lab Notebook	25
Lab Performance	10
Assignments	30
Final Exam (comprehensive)	35
	TOTAL
	100%

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the [Grade Review and Appeals](http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf) policy for more information.
<http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>

COURSE GUIDELINES & EXPECTATIONS

Students may **not** use recording devices in the classroom without the prior permission of the instructor or the Centre for Accessible Learning. The instructor's permission is not required when the use of a recording device

is sanctioned by the College's Centre for Accessible Learning in order to accommodate a student's disability, *and* when the instructor has been provided with an instructor notification letter which specifies the use of a recording device. Such recordings made in the classroom are for the student's personal use only, and distribution of recorded material is prohibited. Recordings made during the course would include statements, questions and comments made by students in the class, and these are not to be disseminated or repeated in any manner based on the recordings. Otherwise, please have cell phones turned off and put away while in lectures. *Thank you.*

SCHOOL OR DEPARTMENTAL INFORMATION

Camosun College is a scent-free institution. Please refrain from wearing scents. Thank you.

STUDENT RESPONSIBILITY

Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

SUPPORTS AND SERVICES FOR STUDENTS

Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit <http://camosun.ca/students/>.

Academic Advising	http://camosun.ca/advising
Accessible Learning	http://camosun.ca/accessible-learning
Counselling	http://camosun.ca/counselling
Career Services	http://camosun.ca/coop
Financial Aid and Awards	http://camosun.ca/financialaid
Help Centres (Math/English/Science)	http://camosun.ca/help-centres
Indigenous Student Support	http://camosun.ca/indigenous
International Student Support	http://camosun.ca/international/
Learning Skills	http://camosun.ca/learningskills
Library	http://camosun.ca/services/library/

Office of Student Support	http://camosun.ca/oss
Ombudsperson	http://camosun.ca/ombuds
Registration	http://camosun.ca/registration
Technology Support	http://camosun.ca/its
Writing Centre	http://camosun.ca/writing-centre

If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

Academic Integrity

Students are expected to comply with all College policy regarding academic integrity; which is about honest and ethical behaviour in your education journey. The following guide is designed to help you understand your responsibilities: <https://camosun.libguides.com/academicintegrity/welcome>
Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.13.pdf> for Camosun's Academic Integrity policy and details for addressing and resolving matters of academic misconduct.

Academic Accommodations for Students with Disabilities

Camosun College is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging appropriate academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a documented disability and think you may need accommodations, you are strongly encouraged to contact the Centre for Accessible Learning (CAL) and register as early as possible. Please visit the CAL website for more information about the process of registering with CAL, including important deadlines: <https://camosun.ca/cal>

Academic Progress

Please visit <https://camosun.ca/sites/default/files/2023-02/e-1.1.pdf> for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

Course Withdrawals Policy

Please visit <https://camosun.ca/sites/default/files/2021-05/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <https://camosun.ca/registration-records/tuition-fees#deadlines>.

Grading Policy

Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.5.pdf> for further details about grading.

Grade Review and Appeals

Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal (see [Medical/Compassionate Withdrawals policy](#)). Please visit <https://camosun.ca/services/forms#medical> to learn more about the process involved in a medical/compassionate withdrawal.

Sexual Violence

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun's Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student's right to choose what is right for them. For more information see Camosun's Sexualized Violence Policy: <https://camosun.ca/sites/default/files/2021-05/e-2.9.pdf> and camosun.ca/services/sexual-violence-support-and-education. To contact the Office of Student Support: oss@camosun.ca or by phone: 250-370-3046 or 250-370-3841

Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College's Student Misconduct Policy at <https://camosun.ca/sites/default/files/2021-05/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

Looking for other policies?

The full suite of College policies and directives can be found here: <https://camosun.ca/about/camosun-college-policies-and-directives>

Changes to this Syllabus: Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.