

# COURSE SYLLABUS



COURSE TITLE: Chem-250 Molecular Biotechnology

CLASS SECTION: 001

TERM: Winter 2022

COURSE CREDITS: 4

DELIVERY METHOD(S): In Person Lectures (3 h) and Labs (3h)

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](#).

For COVID-19 information please visit <https://camosun.ca/about/covid-19-updates>

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*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

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NAME: Armando Jardim

EMAIL: [jardima@camosun.bc.ca](mailto:jardima@camosun.bc.ca)

OFFICE: F350B

HOURS: Tuesday & Wednesday 2:30-4:30 or by 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

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### **CHEM-250 Molecular Biotechnology (4 Credits)**

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): Chem 255

CO-REQUISITE(S): Chem 255

EXCLUSION(S):

## COURSE LEARNING OUTCOMES / OBJECTIVES

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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 & RECOMMENDED PREPARATION / INFORMATION

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(a)	Text	Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4 <sup>th</sup> Ed. Glick <i>et al.</i> (2010).
(b)	Safety Glasses	Bookstore has "UVEX" safety eyewear
(c)	Lab coat	Bookstore has cloth coats available
(d)	Scientific Calculator	Available in bookstore
(e)	Lab Notebook	Blue notebook (A91); Available in bookstore

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

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

<b>Credits</b>	4 credits	<b>Number of weeks</b>	14
<b>Workload / week</b>	3 h lecture 3 h lab 6 h study	<b>Pre- / Co-requisite</b>	CHEM 255

#### Course Locations & Times

	Time		Location
<b>Lecture</b>	Wednesday	8:30 – 9:20 PM	Fisher Building, Room 360
	Friday	12:30 – 2:20 PM	Fisher Building, Room 266
<b>Lab</b>	Wednesday	9:30 – 12:20 PM	Fisher Building, Rooms 358 / 360

## Lecture Outline

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	Manipulating Gene Expression in Prokaryotes & Eukaryotes	18-20	Plant Biotechnology
8	Directed Mutagenesis & Protein Engineering	21	Transgenic Animals
4	DNA Synthesis, Amplification & Sequencing	22-23	Biotechnology & Society

## 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<sub>260nm</sub> -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.

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>

## EVALUATION OF LEARNING

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

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

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**Lecture Attendance:** To benefit from the course content students are expected to attend all classes. It is the student's responsibility to acquire all of the information given during a missed class, including lectures notes, hand-outs and changed exam times and dates, etc.

**Laboratory Attendance:** The course is intended to improve the student's knowledge of biotechnology and a variety of techniques that are routinely used in the laboratory. Consequently, attendance is mandatory. If students miss a lab, they should contact the course instructor to make alternative arrangements.

**Laboratory Notebook:** The lab notebook is a critical component of record keeping in a research and biotechnology laboratory. Students will be responsible for maintaining an up-to-date notebook that must remain on campus. Notebooks will be collected at least three times per term without prior announcement for grading.

**Completion of Assignments:** All students are required to complete assignments and submitted this work by the designated date. Late assignments may be graded but marks equivalent to 10% of the total value of the assignment will be deducted for each day, inclusive of days on the weekend, past the deadline. If assignments

have already been marked and returned, a late assignment will not be accepted. Assignments will not be accepted that are late more than three days, inclusive of days over the weekend.

**Exam Procedures:** All exams must be written at the scheduled times with the exception of students requiring an accommodation by CAL. It is understood that emergency circumstances do occur (e.g. severe illness or family emergency); for such circumstances accommodation may be offered at the discretion of the instructor, provided the student: a) notifies the instructor in advance of the exam (not after), and b) provides documented evidence of the circumstance (e.g. medical certificate). If you have a concern about a grade you have received for an evaluation, please arrange to meet with the instructor. Refer to the Grade Review and Appeals policy for more information. <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>.

## SCHOOL OR DEPARTMENTAL INFORMATION

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ARTS & SCIENCES – Chemistry and GeoSciences

## STUDENT RESPONSIBILITY

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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

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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/>.

Support Service	Website
Academic Advising	<a href="http://camosun.ca/advising">http://camosun.ca/advising</a>
Accessible Learning	<a href="http://camosun.ca/accessible-learning">http://camosun.ca/accessible-learning</a>
Counselling	<a href="http://camosun.ca/counselling">http://camosun.ca/counselling</a>
Career Services	<a href="http://camosun.ca/coop">http://camosun.ca/coop</a>
Financial Aid and Awards	<a href="http://camosun.ca/financialaid">http://camosun.ca/financialaid</a>
Help Centres (Math/English/Science)	<a href="http://camosun.ca/help-centres">http://camosun.ca/help-centres</a>
Indigenous Student Support	<a href="http://camosun.ca/indigenous">http://camosun.ca/indigenous</a>
International Student Support	<a href="http://camosun.ca/international/">http://camosun.ca/international/</a>
Learning Skills	<a href="http://camosun.ca/learningskills">http://camosun.ca/learningskills</a>

Support Service	Website
Library	<a href="http://camosun.ca/services/library/">http://camosun.ca/services/library/</a>
Office of Student Support	<a href="http://camosun.ca/oss">http://camosun.ca/oss</a>
Ombudsperson	<a href="http://camosun.ca/ombuds">http://camosun.ca/ombuds</a>
Registration	<a href="http://camosun.ca/registration">http://camosun.ca/registration</a>
Technology Support	<a href="http://camosun.ca/its">http://camosun.ca/its</a>
Writing Centre	<a href="http://camosun.ca/writing-centre">http://camosun.ca/writing-centre</a>

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.

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## COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

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### Academic Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](#) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started: <http://camosun.ca/services/accessible-learning/>

### Academic Integrity

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

### Academic Progress

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/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 <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

### Grading Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

### Grade Review and Appeals

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

### Mandatory Attendance for First Class Meeting of Each Course

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 reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the “Attendance” section under “Registration Policies and Procedures” (<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

### 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. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> to learn more about the process involved in a medical/compassionate withdrawal.

### Sexual Violence and Misconduct

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 or misconduct 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 and Misconduct Policy: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and [camosun.ca/sexual-violence](http://camosun.ca/sexual-violence). To contact the Office of Student Support: [oss@camosun.ca](mailto:oss@camosun.ca) or by phone: 250-370-3046 or 250-3703841

### 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 <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College’s expectations of academic integrity and student behavioural conduct.

**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.