CAMOSUN COLLEGE	**School of Arts & Science** **CHEMISTRY AND GEOSCIENCE DEPARTMENT** **CHEM 250-001** **Molecular Biotechnology** **Winter 2015**

COURSE OUTLINE

The course description is online @ http://camosun.ca/learn/calendar/current/web/chem.html

Ω *Please note: the College electronically stores this outline for five (5) years only.*
*It is **strongly recommended** you keep a copy of this outline with your academic records.*
You will need this outline for any future application/s for transfer credit/s to other colleges/universities.

1. Instructor Information

(a)	Instructor:	David Stuss		
(b)	Office Hours:	Lansdowne: Mon,Wed,Thur,Fri 14:30 - 15:20 *or by appointment*		
(c)	Location:	Lansdowne: Fisher Building F348D		
(d)	Phone:	(250) 370-3436	Alternative Phone:	
(e)	Email:	stussd@camosun.bc.ca		

2. Intended Learning Outcomes

(No changes are to be made to these Intended Learning Outcomes as approved by the Education Council of Camosun College.)

Upon completion of this course the student will be able to:

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.

3. Required Materials

(a)	Text (*Mandatory*)	***Introduction to Biotechnology,*** 3rd Ed. Thiemann & Palladino. Pearson (2013). (*A copy of this textbook is available in the reserve library*)
(b)	Safety Glasses (*Mandatory*)	Bookstore has "UVEX" safety eyewear – please check if using others
(c)	Lab coat (*Mandatory*)	Bookstore has cloth coats available – please check if using another type
(d)	Lab notebook	Available in bookstore
(e)	Scientific Calculator (*Mandatory*)	Available in bookstore

4. Course Content and Schedule

Credits	4 credits		**Number of weeks**	14
Workload / week	3 h lecture 3 h lab 6 h study		**Pre-requisite** **Pre- or Co-requisite**	CHEM 121 CHEM 230 CHEM 255

Locations & Times

	Time	Location
Lecture	Tuesday, Thursday, Friday 1:30 – 2:20	Fisher Building, Room F360/358
Lab	Tuesday 2:30 – 5:20 PM	Fisher Building, Room F360/358

Lecture Outline

Lecture Topic	Textbook Chapter	Lecture Topic	Textbook Chapter
Introduction to Biotechnology	1	Plant Biotechnology	6
Genes, Genomics, & Recombinant DNA Technology	2-3	Animal Biotechology	7
DNA Fingerprinting & Forensics	8	Aquatic Biotechnology	10
Protein Biotechnology	4	Bioremediation	9
Microbial Biotechnology	5	Regulatory Systems & Patents	12
Medical Biotechnology	11	Ethics	13

Lecture material will be covered at approximately one week per textbook chapter.

Laboratory Outline

I. Preparation of buffers, other solutions, and media

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.

V. Southern Blot Analysis

- Southern transfer technique.
- Southern hybridization using nonradioactively-labeled probe.
- Detection of hybridized DNA probes.
- Interpretation of hybridization results.

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, BLITZ 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.

5. Basis of Student Assessment (Weighting)

(This section should be directly linked to the Intended Learning Outcomes.)

Assignments (5)	35%
Lab Performance / Notebook Evaluation	25%
Final Exam (comprehensive)	40%

(a) Projects and Assignments (5 x 7%) 35 %

Assignment 1. Biotechnology Industry Survey & Company Analysis
Assignment 2. Comparison of Plasmid Purification Methods
Assignment 3. DNA restriction mapping (using lab data)
Assignment 4. Analysis of a Scientific Journal Article
Assignment 5. Analysis of the scientific, regulatory, societal and ethical concerns of a high-profile area of biotechnology (*May include a round-table discussion*)

Assignments will be provided at appropriate times during the semester.

(b) Laboratory Performance & Lab Book Evaluation 25 %

The lab work is a continual flow of experiments utilization recombinant DNA technologies. There are no laboratory reports due to be handed in after each individual experiment. However, students will each maintain a laboratory notebook as they would if they were working in a biotechnology research laboratory. Feedback will be provided throughout the term, and the lab book will be graded at the end of the course. Information provided by a biotechnology intellectual property lawyer will provide the basis for keeping a proper lab book.

An outline of the detailed criteria for evaluation of lab performance will be provided. There is no separate laboratory exam; however, students are responsible for the principles and practical aspects of the laboratory experiments. Any or all of these are potentially subject to examination on the final exam.

Attendance in the lab periods is mandatory. No laboratory experiment can be missed without an acceptable reason submitted in writing, such as a suitable note from Medical Doctor. Reasons for missed labs must also be documented by email to the instructor.

6. Grading System

(No changes are to be made to this section unless the Approved Course Description has been forwarded through the Education Council of Camosun College for approval.)

Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	1
0-49	F	Minimum level has not been achieved.	0

Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress*: A temporary grade assigned for courses that, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. *(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
CW	*Compulsory Withdrawal:* A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services, or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**.
It is the student's responsibility to become familiar with the content of this policy.
The policy is available in each School Administration Office, at Student Services, and the College web site in the Policy Section.