ORIGINAL COURSE IMPLEMENTATION DATE:	May 2005
REVISED COURSE IMPLEMENTATION DATE:	September 2022
COURSE TO BE REVIEWED (six years after UEC approval):	January 2028

Course outline form version: 05/18/2018

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: BIO 403

Number of Credits: 4 Course credit policy (105)

Course Full Title: Molecular Techniques I

Course Short Title:

(Transcripts only display 30 characters. Departments may recommend a short title if one is needed. If left blank, one will be assigned.)

Faculty: Faculty of Science

Department (or program if no department): Biology

Calendar Description:

An intensive laboratory course that introduces students to the methodology used in recombinant DNA technology using an integrated series of molecular biology techniques. Techniques studied include cloning, subcloning, restriction mapping, PCR analysis, and bioinformatics. This course prepares students for careers in research or the biotechnology/pharmaceuticals industry.

Note: This course is offered as BIOC 403 and BIO 403. Students may take only one of these for credit.

Prerequisites (or NONE): BIO 202, BIO 220, BIO 309, and one of the following: BIO 312, BIO 320, BIO 425, or BIO 401.

Corequisites (if applicable, or NONE):

Pre/corequisites (if applicable, or NONE):

Antirequisite Courses *(Cannot be taken for additional credit.)*

Former course code/number:

Cross-listed with: **BIOC 403**

Dual-listed with:

Equivalent course(s): **BIOC 403**

(If offered in the previous five years, antirequisite course(s) will be included in the calendar description as a note that students with credit for the antirequisite course(s) cannot take this course for further credit.)

Typical Structure of Instructional Hours

Lecture/seminar hours	25
Tutorials/workshops	
Supervised laboratory hours	65
Experiential (field experience, practicum, internship, etc.)	
Supervised online activities	
Other contact hours:	
Total hours	**90**

Labs to be scheduled independent of lecture hours: ☒ No ☐ Yes

Special Topics *(Double-click on boxes to select.)*

This course is offered with different topics:

☒ No ☐ Yes *(If yes, topic will be recorded when offered.)*

Independent Study

If offered as an Independent Study course, this course may be repeated for further credit: *(If yes, topic will be recorded.)*

☒ No ☐ Yes, repeat(s) ☐ Yes, no limit

Transfer Credit

Transfer credit already exists: *(See **bctransferguide.ca**.)*

☒ No ☐ Yes

Submit outline for (re)articulation:

☒ No ☐ Yes *(If yes, fill in transfer credit form.)*

Grading System

☒ Letter Grades ☐ Credit/No Credit

Maximum enrolment (for information only): 24

Expected Frequency of Course Offerings: Annually biennially *(Every semester, Fall only, annually, etc.)*

Department / Program Head or Director: Gregory Schmaltz	**Date approved:**	September 2021
Faculty Council approval	**Date approved:**	October 8, 2021
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	January 28, 2022

Learning Outcomes:

Upon successful completion of this course, students will be able to:

1. Work independently within a laboratory setting.
2. Demonstrate familiarity with the use of laboratory equipment.
3. Prepare chemicals and media used in their projects.
4. Record, interpret, and present scientific data to support their ongoing projects and aid in troubleshooting.
5. Describe the biochemistry and biophysics of a symbiotic relationship.
6. Isolate and clone DNA from an operon which encodes proteins responsible for a defined phenotype.
7. Manipulate DNA using recombinant DNA technology, including restriction analysis, agarose gel electrophoresis, ligations, transformation, preparation and screening a genomic library, and Southern blotting and hybridizations.
8. Use bioinformatics to screen genomic and protein data bases to understand the structure/function of the genes and gene products from the operon under study.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods *(Guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion.)*

Laboratory exercises, analysis of data lectures, maintaining a laboratory manual, and completing problem sets.

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Text(s) and Resource Materials *(If more space is required, download Supplemental Texts and Resource Materials form.)*

	Author (surname, initials)	Title (article, book, journal, etc.)	Publisher	Year
1.	Winfrey MR, Rott MA, Wortman A	Unraveling DNA: Molecular Biology for the Laboratory	Cummings	1997
2.				

Required Additional Supplies and Materials *(Software, hardware, tools, specialized clothing, etc.)*

Students are required to supply a lab coat and a bound laboratory notebook.

Typical Evaluation Methods and Weighting

Final lab exam:	35%	Quizzes/tests:	20%	Field experience:	%	Maintenance of lab journal:	15%
Midterm lab exam:	20%	Lab technique:	10%	Practicum:	%	Total:	100%

Details (if necessary):

Typical Course Content and Topics

Laboratory techniques
- Introduction to the laboratory, basic equipment, and bacteriological techniques
- Preparation of media and reagents used in molecular biology
- Proper use of micropipettes

DNA Isolation and analysis
- Isolation of chromosomal DNA from Vibrio fisheri
- Large scale purification of plasmid DNA
- Spectrophotometric analysis of DNA

Cloning of the lux operon
- Restriction digestion of genomic and plasmid DNA
- Ligation of restriction fragments of genomic DNA to a plasmid vector
- Preparation of competent *Escherichia coli*
- Transformation of competent *E. coli* with recombinant plasmids
- Screening of the genomic library for light producing clones

Restriction mapping and Southern blotting:
- Small scale plasmid isolations (mini-preps) from bioluminescent clones
- Southern blotting and hybridization to detect the *lux*A gene

Subcloning the l*ux*A *lux*B genes
- Restriction mapping of *lux* plasmids for subcloning *lux*A and *lux*B genes
- Gel purification of DNA restriction fragments containing *lux*A and *lux*B genes
- Subcloning *lux*A and luxB genes into a plasmid vector
- Transformation of competent *E. coli* with subcloned DNA
- Colony hybridization to screen for *lux*A *lux*B subclones
- Small scale plasmid isolations (mini-preps) from *lux*A *lux*B subclones
- PCR analysis of *lux*A gene

Use of bioinformatics in analysis of DNA sequence
- Computer analysis of the lux operon DNA sequence
- Computer analysis of the *lux* protein sequences