



# UNIVERSITY OF CALGARY

## DEPARTMENT OF BIOLOGICAL SCIENCES COURSE OUTLINE

### 1. **Course:** BIOCHEMISTRY 401 – Biochemistry Laboratory Techniques I

LECTURE:	L01:	TR	9:30-10:45	BI 561	FALL 2016
LABS:	B01	Wed	1300-1850	BI 117	
	B02	Thurs	1100-1650	BI 117	

COURSE COORDINATOR: Dr. V. Zaremborg

Instructor(s):	Dr. V. Zaremborg	220-4298	BI 390	vzaremb@ucalgary.ca
	Dr. R. Edwards	220-5350	BI 443	redwards@ucalgary.ca
	Dr. S. Zimmerly	220-7933	BI 319C	zimmerly@ucalgary.ca

Desire 2 Learn (D2L) course name: BCEM 401 L01 - (Fall 2016) - Biochemistry Lab Techniques I

Biological Sciences Department BI 186 220-3140 [biosci@ucalgary.ca](mailto:biosci@ucalgary.ca)

2. **Prerequisites:** One of Chemistry 353 or 355; and Biochemistry 393  
See section 3.5.C in the Faculty of Science section of the online Calendar ([www.ucalgary.ca/pubs/calendar/current/sc-3-5.html](http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html))

**Antirequisites:** Credit for both Biochemistry 401 and either 541 or CMMB 451 will not be allowed.

3. **Grading:** The University policy on grading and related matters is described sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Midterm Exam	25%
Final Exam	25%
Long Lab Reports & Assignment (2x6%)	12%
Medium Lab Reports (6x4%)	24%
Short Lab Reports (3x2%)	6%
Practical Assessment	4%
Lab Book	4%

There will be a final examination scheduled by the Registrar's Office.

**A mark of  $\geq 58\%$  is required on the laboratory portion of this course (all components except the exams) to pass the course as a whole.**

Each piece of work (assignment, laboratory report, midterm test or final examination) submitted by the student will be assigned a percentage score. The student's average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade, (bearing in mind that an F grade will result if the student does not pass the laboratory component).

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar
5. **Scheduled out-of-class activities:** Dates and times of approved class activities held outside of class hours.

MIDTERM EXAM- NOV. 15, 8:00 – 10:45 A.M. TBA

**REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY.** If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. **Course Materials:** All materials including lecture notes and lab manuals will be available in D2L
7. **Examination Policy:** The use of camera devices, MP3 Players and headphones, wireless earbuds or wireless access devices such as smart phones, smart watches, iOS and/or Android, etc., during the examination will not be allowed. Students should also read the Calendar, [Section G](#), on Examinations.
8. **Writing across the curriculum statement:** In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. See also [Section E.2](#) of the University Calendar.

#### ETHICS IN THE BIOLOGICAL SCIENCES

Studies in the Biological Sciences involve the use of living and dead organisms. Students taking laboratory- and field-based courses in these disciplines can expect involvement with and experimentation on such materials. Students perform dissections on dead or preserved organisms in some courses. In particular courses, students experiment on living organisms, their tissues, cells, or molecules. Sometimes field work requires students to collect a variety of living materials by many methods, including humane trapping.

All work on humans and other animals conforms to the Helsinki Declaration and to the regulations of the Canadian Council on Animal Care. The Department strives for the highest ethical standards consistent with stewardship of the environment for organisms whose use is not governed by statutory authority. Individuals contemplating taking courses or majoring in one of the fields of study offered by the Department of Biological Sciences should ensure that they have fully considered these issues before enrolling. Students are advised to discuss any concern they might have with the Undergraduate Program Director of the Department.

#### 9. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Academic Misconduct:** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties
- (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- (c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at [http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities\\_0.pdf](http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf).
- Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Biological Sciences, Dr. H. Addy by email [addy@ucalgary.ca](mailto:addy@ucalgary.ca) or phone 403 220-3140.
- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>

**(f) Student Union Information:** VP Academic Phone: 403 220-3911 Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca)  
SU Faculty Rep. Phone: 403 220-3913 Email:  
[science1@su.ucalgary.ca](mailto:science1@su.ucalgary.ca), [science2@su.ucalgary.ca](mailto:science2@su.ucalgary.ca) and [science3@su.ucalgary.ca](mailto:science3@su.ucalgary.ca);  
Student Ombuds Office: 403 220-6420 Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca);  
<http://ucalgary.ca/provost/students/ombuds>

**(g) Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

**(h)** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses ([www.ucalgary.ca/usri](http://www.ucalgary.ca/usri)). Your responses make a difference - please participate in USRI Surveys.

Department Approval \_\_\_\_\_ ORIGINAL SIGNED \_\_\_\_\_ Date \_\_\_\_\_

Associate Dean's Approval for  
out of regular class-time activity: \_\_\_\_\_ ORIGINAL SIGNED \_\_\_\_\_ Date: \_\_\_\_\_  
C401 F16; 8/10/2016 10:40 AM

Grade Scale

86%	⇒ A
82	⇒ A-
78	⇒ B+
74	⇒ B
70	⇒ B-
66	⇒ C+
62	⇒ C
58	⇒ C-
54	⇒ D+
50	⇒ D
< 50%	⇒ F

Lab Grade Scale

≥58% ⇒ pass

## **BCEM401- Learning outcomes**

### **By the end of this course, successful students will be able to:**

1. Describe the structure and the chemical properties of nucleic acids (RNA and DNA).
2. Explain and apply methods used in the purification, quantification and analysis of nucleic acids.
3. Master and troubleshoot basic molecular biology techniques for cloning and expression of recombinant proteins in *E. coli*.
  - identification of open reading frames
  - primer engineering for Polymerase Chain Reaction (PCR) amplification
  - design of cloning strategies for expression of recombinant proteins in *E. coli*
  - effective use of a basic molecular biology toolbox including enzymes (restriction enzymes, T4DNA ligase, Taq polymerases), cloning and expression vectors
  - selection and screening strategies
  - DNA sequencing
  - pilot gene expression and recombinant protein production trial
4. Analyze sequences of nucleic acids and proteins using bioinformatic resources in order to predict the structure and function of these macromolecules.
5. Prepare reagents for experiments using good quantitative skills
6. Implement biochemical and biophysical techniques to purify, characterize and manipulate biomolecules, particularly proteins and nucleic acids
7. Operate in an effective team as demonstrated by the ability to give and take instructions
8. Work safely alone and in an effective team as demonstrated by the ability to recognize unsafe situations and to access and interpret safety data
9. Communicate their biochemical experiments in written reports with clarity and conciseness
10. Manage time effectively to meet deadlines for course requirements

**BCEM 401 – Biochemistry Laboratory Techniques I- F2016**  
**TENTATIVE SCHEDULE (Due dates for the reports are in red)**

Week	Month	Day		Description of Lectures and Labs
1	Sept	13	VZ RE-1	Introduction to the Course and first lab
1	Sept	14, 15	RE –Lab 1a	Library -End-Note*, LAB: Safety and Basic Techniques <b>Report is 2% → Sept 21 &amp; 22</b>
1	Sept	15	SZ - 1	Nucleotide structures, DNA and RNA structures
2	Sept	20	SZ - 2	Enzymes and enzymatic manipulation of DNA and RNA
2	Sept	21,22	SZ –Lab 1b	LAB: Nucleic Acids *Bioinformatics Lab <b>Report is 4 %→ Sept 28 &amp; 29</b>
2	Sept	22	SZ – 3	Plasmid structure, purification of nucleic acids, separation of DNA
3	Sept	27	SZ – 4	Central dogma, prokaryotic/eukaryotic gene structures
3	Sept	28, 29	VZ – Lab 1c	LAB: Basic Techniques for Rec DNA Manipulation <b>Report is 2%→ Oct 5 &amp; Oct 6</b>
3	Sept	29	SZ – 5	PCR, colony PCR, primer design
4	Oct	4	VZ -1	Cloning I
4	Oct	5, 6	VZ – Lab 2	LAB: Recombinant DNA Techniques-1 <b>Report is 4%→ Oct 12 &amp; 13</b>
4	Oct	6	VZ -2	Cloning II
5	Oct	11	VZ -3	Cloning III
5	Oct	12, 13	VZ – Lab 3	LAB: Recombinant DNA Techniques-2 <b>Report is 2%→ Oct 19 &amp; 20</b>
5	Oct	13	VZ -4	Cloning IV
6	Oct	18	VZ -5	Expression vectors
6	Oct	19, 20	VZ – Lab 4	LAB: Recombinant DNA Techniques-3 <b>Cloning Assignment is 6% →Oct 26 &amp; 27</b>
6	Oct	20	VZ -6	Sequencing –visit to the sequencing facility and lecture in the Health Science Building
7	Oct	25	VZ -7	Other cloning strategies
7	Oct	26, 27	VZ – Lab 5	LAB: Recombinant DNA Techniques-4 <b>Report is 4%→ Nov 2 &amp; 3</b>
7	Oct	27	VZ -8	Mutagenesis
8	Nov	1	RE-2	Proteins - properties and functions
8	Nov	2, 3	VZ – Lab 6	LAB: Recombinant DNA Techniques-5 <b>Report is 6%→ Nov 14</b>
8	Nov	3	RE-3	Protein bioinformatics
9	Nov	8	VZ-SZ	Review
9	Nov	9,10		***** Reading Days – no labs
9	Nov	10		***** Reading Days– no lecture *****
10	Nov	15	VZ-SZ	<b>midterm in class (8:00-10:45 am) room-TBA</b>
10	Nov	16, 17	RE-L ab 2a	LAB: Protein Bioinformatics Lab <b>Report is 4%→ Nov 23 &amp; 24 -</b>
10	Nov	17	RE-4	Protein absorbance and concentration
11	Nov	22	RE-5	Protein refolding
11	Nov	23, 24	RE- Lab 3a	LAB: Protein Absorbance and Concentration <b>Report is 4%→ Nov 30 &amp; Dec 1</b>
11	Nov	24	RE-6	Protein activity
12	Nov	29	SZ – 6	Real-time PCR, hybridization and blots
12	Nov-	30, 1	RE – Lab 4a	LAB: Working with Proteins. <b>Report is 4%→ Dec 7 &amp; 8</b>

	Dec			
12	Dec	1	SZ – 7	Hybridizations and blots (continued)
13	Dec	6	SZ – 8	Next-generation sequencing technologies I
13	Dec	7,8		DATA analysis and writing final report
13	Dec	8	SZ – 9	Next-generation sequencing technologies II
Exam period	Dec	TBA	SZ & RE	FINAL exam scheduled by the Registrar (3 hours)

**\*LIBRARY SESSION Room TBA**

**Wednesday, September 14, 1-3 pm**

**Thursday, September 15, 11-1 pm**

**Computer Labs: rooms TBA**

**Bioinfo-DNA**

**Sept 21      13:00-18:50**

**Sept 22      11:00-16:50**

**Bioinfo-Proteins**

**Nov 16              13:00-18:50**

**Nov 17              11:00-16:50**