

UNIVERSITY OF CALGARY
DEPARTMENT OF BIOLOGICAL SCIENCES
COURSE OUTLINE

1. Course: **BIOCHEMISTRY 403 – BIOCHEMISTRY LABORATORY TECHNIQUES II**

Lecture Sections: **L01** TR 09:30 **BI 587** Winter 2017

LABS: B01 W 13:00 – 18:50 BI 117
 B02 R 11:00 – 16:50 BI 117
 B03 F 13:00 – 18:50 BI 117 (Tentative)

Course Coordinator: Dr. R. Edwards

Instructor(s): **Dr. E. Lohmeier-Vogel** **BI 039** **220-8281** lohmeier@ucalgary.ca
 Dr. G. Moorhead **BI 144A** **220-6238** moorhead@ucalgary.ca
 Dr. R. Edwards **BI 443** **220-5350** redwards@ucalgary.ca

D2L course website: BCEM403 W2017

Biological Sciences Department BI 186; (403) 220-3140; biosci@ucalgary.ca

2. **PREREQUISITES:** Chemistry 311 and Biochemistry 401 and 471
 See section 3.5.C in the Faculty of Science section of the online Calendar
 (<http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html>)

ANTIREQUISITE: Credit for both Biochemistry 403 and 541 will not be allowed.

3. **GRADING:** The University policy on grading and related matters is described in “Academic Regulations, sections F.1 and F.2” of the online University Calendar (<http://www.ucalgary.ca/pubs/calendar/current/f-1.html> and <http://www.ucalgary.ca/pubs/calendar/current/f-2.html>) In determining the overall grade in the course the following weights will be used:

Midterm exam (first half of the course)	22%
Final exam (last half of the course)	22%
Labs 1-5 short reports 2% each	10%
Labs 1-5 combined as a protein purification paper	15%
Labs 6-10 5% each (full reports)	25%
Lab book, practical assessment	6%

A mark of $\geq 58\%$ is the minimal passing grade for the lab component of this course.

There will be a final exam scheduled by the Registrar's office.

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 a failing grade will result if the student does not pass the combined lab component which consists of all components except the exams.

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: <http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html>. It is the student's responsibility to familiarize himself/herself with these regulations. See also <http://www.ucalgary.ca/pubs/calendar/current/e-3.html>.

5. Dates and times of class exercises held outside of class hours: None

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.

Midterm 1 Thursday, February 16 8:45-10:45 Partially In class

6. **EXAMINATION POLICY:** No electronic or written aids (eg. cell phones, tablets, computers, PDAs, notes, textbooks) will be allowed during writing of any exams. Non-programmable calculators will be permitted to answer quantitative questions on exams, if applicable, and permission to do this will be clearly indicated on the examination paper. Students should also read the Calendar, Section G, on Examinations: <http://www.ucalgary.ca/pubs/calendar/current/g.html>.

7. **Course Materials:** Biochemistry Laboratory, Modern Theory and Techniques by Rodney Boyer (suggested)
8. In this course, the quality of the student's writing in laboratory reports and on exam answers will be a factor in the evaluation of those reports. See also <http://www.ucalgary.ca/pubs/calendar/current/e-2.html>.
9. **STUDIES IN THE BIOLOGICAL SCIENCES INVOLVE THE USE OF LIVING AND DEAD ORGANISMS.** Students are expected to be familiar with <http://www.ucalgary.ca/pubs/calendar/current/sc-5-1.html> of the on-line calendar. See also <http://www.ucalgary.ca/pubs/calendar/current/e-5.html>.
10. **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 K. Student Misconduct (<http://www.ucalgary.ca/pubs/calendar/current/k.html>) 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 at <http://www.ucalgary.ca/emergencyplan/assemblypoints>.**
- (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.
- 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 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:** 220-3911 **Email:** suvpaca@ucalgary.ca.
SU Faculty Rep. **Phone:** 220-3913 **Email:** sciencerep@su.ucalgary.ca Website <http://www.su.ucalgary.ca/home/contact.html>.
Student Ombudsman: www.ucalgary.ca/provost/students/ombuds; ombuds@ucalgary.ca 220-6420
- (g) **INTERNET and ELECTRONIC COMMUNICATION DEVICE Information.** You can assume that in all classes that you attend, **your cell phone should be turned off.** 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). Your responses make a difference - please participate in USRI Surveys.

Department Approval: ORIGINAL SIGNED **Date** _____

Associate Dean's Approval

For out of class-time activity: ORIGINAL SIGNED **Date** _____

C403 W17; 11/17/2016 2:26 PM

Grading Scale: A+ : >94%, A : 86%; A- : 82%; B+ : 78-; B : 74; B- : 70%; C+ : 66%; C : 62%; C- : 58%; D+ : 54%; D : 50%; F : below 50%; Except Labs: F = Below 58%

BCEM403 Winter 2017: Tentative Lecture Schedule

Date	Topic	Instructor	
Jan.	10	Introduction to the course/ introduction to protein purification	RAE/ELV
	11/12	Lab 1: β-galactosidase assays and background search	ELV
	12	The β -galactosidase assay, preparation for lab 1	ELV
	17	Cell breakage methods	ELV
	18/19	Lab 2: Ammonium sulfate precipitation of β-galactosidase	ELV
	19	Protein precipitation methods	ELV
	24	Ion exchange chromatography	ELV
	25/26	Lab 3: Ion exchange chromatography of β-galactosidase	ELV
	26	Ion exchange chromatography/Gel filtration chromatography	ELV
	31	Gel filtration applications	ELV
Feb	1/2	Lab 4: Gel filtration chromatography of β-galactosidase	ELV
	2	Protein assays	ELV
	7	Purification table/SDS PAGE	ELV
	8/9	Lab 5: SDS PAGE of β-galactosidase	ELV
	9	SDS PAGE	ELV
	14	HIC (example), dye chromatography	ELV
	15/16	Writing up Protein Purification Paper.	ELV
	16	MIDTERM – in class – 2 hours, starting at 8:45 am	ELV
	19-26	Reading Week – no classes	
	28	Western blotting and antibodies-1 <u>Protein paper due!</u>	GM
Mar	1/2	Lab 6: Western blotting/native PAGE	ELV
	2	Western blotting and antibodies-2	GM
	7	Bioaffinity chromatography-1	GM
	8/9	Lab 7: His-tag chromatography	RAE
	9	Bioaffinity chromatography-2	GM
	14	Prep for Lab #8	RAE
	15/16	Lab 8 Kinetics of β-galactosidase	RAE
	16	Circular Dichroism	RAE
	21	Prep for Lab #9	RAE
	22/23	Lab 9: Protein stability by absorbance, fluorescence and CD	RAE
	23	Analysis of spectroscopic data	RAE
	28	Prep for lab #10	RAE
	29/30	Lab 10: Ligand binding project (fluor & equil dialysis)	RAE
	30	Principles of Ligand binding	RAE
April	4	Ligand binding data analysis	RAE
	5 & 6	Writing Lab report	RAE
	6	Project Wrap Up	RAE
	11	Synopsis and Review	RAE/GM

Final Exam: A **three hour** exam will be scheduled by the registrar.

BCEM403- Learning outcomes

General – BCEM 403 builds on the general learning outcomes of BCEM 401 (the prerequisite course). Students are expected to work safely and effectively together as a team and to record their experimental data in a laboratory notebook, as is done in professional settings.

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

1. Search for background references and extract bioinformatic information pertaining to a protein that will be purified in the first part of the course.
2. Purify the protein of interest to homogeneity using classical and methods of purification, detection, and quantification.
3. Write a paper using formatting as specified by a journal selected by the instructor.
4. Describe the importance of protein: protein interactions in biochemistry and apply various biochemical approaches (for example, using antibodies) to detecting these interactions.
5. Know how to apply various affinity chromatography methods to purify recombinant proteins expressed with special affinity tags.
6. Analyze the kinetic parameters and inhibition of an enzyme.
7. Implement spectroscopic techniques and biophysical techniques to characterize proteins and to monitor the binding of ligands to proteins.
8. Design and implement experiments to answer questions about the structure and function of enzymes and proteins.
9. Interpret and communicate the results of biochemical experiments in written reports with clarity and conciseness.