



UNIVERSITY OF CALGARY  
 FACULTY OF SCIENCE  
 DEPARTMENT OF BIOLOGICAL SCIENCES  
 COURSE OUTLINE

1. **Course: CMMB 523 – DNA GENOMES AND RNA FUNCTION**

Lecture Section: L01      MWF      14:00-14:50      SA 235      WINTER 2018

Course Coordinator:      Dr. Zimmerly

Instructor(s):      Dr. S. Zimmerly      BI 319C      220-7933      zimmerly@ucalgary.ca  
                                  Dr. S.L. Wong      BI 178A      220-5721      slwong@ucalgary.ca

D2L: CMMB 523 L01 (Winter 2018) - DNA Genomes and RNA Function  
 Biological Sciences Department BI 186; (403) 220-3140; biosci@ucalgary.ca

2. **PREREQUISITE(S):**      CMMB 411  
 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>)

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 | 33 % | Feb. 8, 2018 |
| Midterm Quiz | 10 % |              |
| Assignments  | 15 % |              |
| Final Exam   | 42 % |              |

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

The final grade is obtained from averaging all components.

|                       |    |    |    |    |    |    |    |    |    |    |    |
|-----------------------|----|----|----|----|----|----|----|----|----|----|----|
| Letter Grade          | A+ | A  | A- | B+ | B  | B- | C+ | C  | C- | D+ | D  |
| Min. Percent Required | 90 | 85 | 80 | 76 | 73 | 70 | 66 | 63 | 60 | 55 | 50 |

Each piece of work (assignment, 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.

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      Thursday, February 08, 2018; 7:00-9:00 pm      ENG 60

**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:** TEXT: Recommended: Molecular Biology of the Gene. Watson et al. Pearson. 7th Edition. (or equivalent textbook)

7. **Examination Policy:** Calculators are not allowed for examinations. The use of wireless devices, such as cell phones, PDAs (Palm OS or pocket PC devices etc.), and camera devices during the examinations 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 assignments will be a factor in evaluation of the assignments. See also Section E.2 of the University Calendar.

9. **Human studies statement:** See also [Section E.5](#) 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.

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

- (a) **Misconduct:** 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) **Academic Accommodation Policy:** Students with documentable disabilities are referred to the following links: Students with Disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html> [B.1](#) and Student Accessibility Services: <http://www.ucalgary.ca/access/>.
- (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 (FOIPPA). 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 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.
- (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) **U.S.R.I.:** 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 \_\_\_\_\_  
M523 co W18; 12/13/2017 3:09 PM

## **Course Content**

### **1. Regulation of prokaryotic gene expression (SLW)**

Methods to study bacterial transcription: (a) Recombinant DNA methods to produce and purify transcription factors; (b) Footprinting and other molecular biological approaches (e.g. surface plasmon resonance based biosensor) to study protein-nucleic acid and protein-protein interactions. Structure-function studies of both RNA polymerase and promoter sequences, analyses of the transcription process and examples of gene regulation by different strategies.

### **2. Genome sequencing (SZ)**

Strategies and methods for sequencing bacterial and eukaryotic genomes. Genome composition of bacterial and eukaryotic genomes, with emphasis on the human genome. Next-generation sequencing and applications. Genome-wide experiments such as ChIP-Seq that query cellular processes on a genomic scale.

### **3. Topics in eukaryotic gene expression and RNA (SZ)**

Summary of the diverse roles of RNA in the cell. Post-transcriptional regulation mechanisms, non-coding RNAs, riboswitches, catalytic RNAs and the RNA world hypothesis.

## **Learning Outcomes**

At the end of the course, students with satisfactory performance will be able to:

1. Apply knowledge learned from the prokaryotic transcription and translation processes to optimize protein production in *E. coli* using the recombinant DNA technology.
2. Explain the principle of surface plasmon resonance and apply this technology to study biomolecular interactions.
3. Describe footprinting techniques to study protein-nucleic interactions.
4. Explain prokaryotic gene regulation via transcriptional/translational controls and stabilities of biomolecules.
5. Describe the technologies for DNA sequencing and the assembly of genome sequences, including next-generation sequencing methods.
6. Describe and compare gene organizations and genetic components in bacteria, yeast, worm, fly and humans.
7. Design and explain experiments to address biological functions on a genome-wide scale.
8. Explain the mechanisms and significance of diverse non-coding RNAs in cells, including catalytic RNAs.