



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

1. **Course:** CMMB 411, Molecular Genetics -- Fall 2018

Instructor Name	Email	Phone	Office	Hours
<i>L01:</i> ( MWF 15:00 - 15:50 in ST 143)				
Steven Zimmerly	zimmerly@ucalgary.ca	403-220-7933	Biological Sciences 319C	Send E-mail to set up an appointment
Sui-Lam Wong	slwong@ucalgary.ca	403-220-5721	BI 178A	Send E-mail to set up an appointment

Dr. S.-L. Wong (Coordinator)

**Course Site:**

D2L: CMMB 411 L01-(Fall 2018)-Molecular Genetics

**Department of Biological Sciences:**

Office: BIO 186  
Phone: 403 220-3140  
Email: biosci@ucalgary.ca

**Note:**

Students must use their U of C account for all course correspondence.

2. **Requisites:**

See section [3.5.C](#) in the Faculty of Science section of the online Calendar.

**Prerequisite(s):** One of Biology 311 or Medical Science 341; one of Biology 331 or Medical Science 351; and one of Biochemistry 341 or Biochemistry 393.

**Notes:** Prior completion of or concurrent registration in Biochemistry 401 or 443 is strongly recommended.

3. **Grading:**

The University policy on grading and related matters is described in [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Component(s)	Weighting %	Date
In-class quiz 1	12%	October 5, 2018
Midterm Exam	46%	November 3, 2018 ST 140
In-class quiz 2	8%	November 23, 2018
Final Exam	34%	

Students must achieve a passing grade (minimum of D) on the lecture portion of the course (average of the quizzes, midterm and final exams) to qualify for a passing grade overall.

Each piece of work (reports, assignments, quizzes, midterm exam(s) or final examination) submitted by the student will be assigned a grade. The student's grade for each component 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.

The conversion between a percentage grade and letter grade is as follows.

	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
<b>Minimum % Required</b>	93 %	88 %	83 %	78%	73%	68 %	64 %	60%	56%	52 %	48 %

This course has a registrar scheduled final exam.

#### 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/themself with these regulations. See also [Section E.3](#) of the University Calendar.

#### 5. Scheduled out-of-class activities:

The following out of class activities are scheduled for this course.

Activity	Location	Date and Time	Duration
MT EXAM	ST 140	Saturday, November 3, 2018 at 2:00 pm	3 Hours

**REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY.** If you have a conflict with the out-of-class-time-activity, please contact your course coordinator/instructor no later than **14 days prior** to the date of the out-of-class activity so that alternative arrangements may be made.

#### 6. Course Materials:

Required Textbook(s):

Watson, Baker, Bell, Gann, Levine, Losick, *Molecular Biology of the Gene, 7th edition*: Pearson .

The use of "Mastering Biology" provided by the textbook publisher is strongly recommended.

Mastering Biology is a web-based platform which provides useful exercises and animations to help you learn the important concepts presented in your textbook. The course code for CMMB 411 is wong31476. The access code usually comes with the textbook package. If you use a used textbook, you can buy the access code from the textbook publisher.

#### 7. Examination Policy:

No electronic or written aids (e.g. 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.

#### 8. Approved Mandatory and Optional Course Supplemental Fees:

There are no mandatory or optional course supplemental fees for this course.

#### 9. Writing across the Curriculum Statement:

For all components of the course, in any written work, the quality of the student's writing (language, spelling, grammar, presentation etc.) can be a factor in the evaluation of the work. See also Section [E.2](#) of the University Calendar.

## 10. Human & living organism studies statements:

Students will not participate as subjects or researchers in human studies.

See also [Section E.5](#) of the University Calendar.

**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.

Students are expected to be familiar with [Section SC.4.1](#) of the University Calendar.

## 11. Reappraisal of Grades:

A student wishing a reappraisal, should first attempt to review the graded work with the Course coordinator/instructor or department offering the course. Students with sufficient academic grounds may request a reappraisal. Non-academic grounds are not relevant for grade reappraisals. Students should be aware that the grade being reappraised may be raised, lowered or remain the same. See [Section I.3](#) of the University Calendar.

1. **Term Work:** The student should present their rationale as effectively and as fully as possible to the Course coordinator/instructor within **15 days** of either being notified about the mark, or of the item's return to the class. If the student is not satisfied with the outcome, the student shall immediately submit the Reappraisal of Graded Term work form to the department in which the course is offered. The department will arrange for a re-assessment of the work if, and only if, the student has sufficient academic grounds. See sections [I.1](#) and [I.2](#) of the University Calendar
2. **Final Exam:** The student shall submit the request to Enrolment Services. See [Section I.3](#) of the University Calendar.

## 12. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- a. **Mental Health** The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, [Mental Health Services Website](#)) and the Campus Mental Health Strategy website ([Mental Health](#)).
- b. **SU Wellness Center:** The Students Union Wellness Centre provides health and wellness support for students including information and counselling on physical health, mental health and nutrition. For more information, see [www.ucalgary.ca/wellnesscentre](http://www.ucalgary.ca/wellnesscentre) or call [403-210-9355](tel:403-210-9355).
- c. **Sexual Violence:** The University of Calgary is committed to fostering a safe, productive learning environment. The Sexual Violence Policy (<https://www.ucalgary.ca/policies/files/policies/sexual-violence-policy.pdf>) is a fundamental element in creating and sustaining a safer campus environment for all community members. We understand that sexual violence can undermine students' academic success and we encourage students who have experienced some form of sexual misconduct to talk to someone about their experience, so they can get the support they need. The Sexual Violence Support Advocate, Carla Bertsch, can provide confidential support and information regarding sexual violence to all members of the university community. Carla can be reached by email ([svsa@ucalgary.ca](mailto:svsa@ucalgary.ca)) or phone at [403-220-2208](tel:403-220-2208).
- d. **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. Examples of academic misconduct may include: submitting or presenting work as if it were the student's own work when it is not; submitting or presenting work in one course which has also been submitted in another course without the instructor's permission; collaborating in whole or in part without prior agreement of the instructor; borrowing experimental values from others without the instructor's approval; falsification/

fabrication of experimental values in a report. **These are only examples.**

- e. **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- f. **Academic Accommodation Policy:** 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 [procedure-for-accommodations-for-students-with-disabilities.pdf](#).
- Students needing an accommodation in relation to their coursework or to fulfill requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Associate Head, Undergraduate of the Department of Biological Sciences, Heather Addy by email [addy@ucalgary.ca](mailto:addy@ucalgary.ca) or phone 403 220-6979. Religious accommodation requests relating to class, test or exam scheduling or absences must be submitted no later than **14 days** prior to the date in question. See [Section E.4](#) of the University Calendar.
- g. **Safewalk:** Campus Security will escort individuals day or night (See the [Campus Safewalk](#) website). Call [403-220-5333](tel:403-220-5333) for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- h. **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). 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 [Legal Services](#) website.
- i. **Student Union Information:** [VP Academic](#), Phone: [403-220-3911](tel:403-220-3911) Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca). SU Faculty Rep., Phone: [403-220-3913](tel:403-220-3913) Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). Student Ombudsman, Email: [suvpaca@ucalgary.ca](mailto:suvpaca@ucalgary.ca).
- j. **Internet and Electronic Device Information:** Unless instructed otherwise, cell phones should be turned off during class. All communication with other individuals via laptop, tablet, smart phone or other device is prohibited during class unless specifically permitted by the instructor. Students that violate this policy may be asked to leave the classroom. Repeated violations may result in a charge of misconduct.
- k. **Surveys:** At the University of Calgary, feedback through the Universal Student Ratings of Instruction ([USRI](#)) survey and the Faculty of Science Teaching Feedback form provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses. Your responses make a difference - please participate in these surveys.

#### COURSE OUTLINE CMMB 411

1. DNA (SLW)  
DNA topology and topoisomerases  
(7<sup>th</sup> edition: Chapter 4, pp 77-89, pp 92-105; Chapter 9, pp 303; 6<sup>th</sup> edition: Chapter 6, pp 117-127).
2. Prokaryotic DNA Replication (SLW)  
DNA polymerases, primase, sliding clamp and clamp loader, replication fork, origins of replication and replication process. (7<sup>th</sup> edition: Chapter 9, pp 257-296; Chapter 10, pp 320; 6<sup>th</sup> edition: Chapter 8, pp 195-239)
3. Prokaryotic Mechanisms of Transcription (SLW)  
RNA polymerases, structural features of promoters and terminators, prokaryotic transcription process.  
(7<sup>th</sup> edition: Chapter 13, pp 429-447; 6<sup>th</sup> edition: Chapter 12, pp 377-397)
4. Gene regulation in Prokaryotes (SLW)  
Regulatory proteins, regulatory mechanisms at transcription initiation, elongation and termination.  
(7<sup>th</sup> edition: Chapter 18, pp 615-631, 634; 6<sup>th</sup> edition: Chapter 16, pp 547-567)
5. Translation (SLW)  
Structural and functional features of mRNA and tRNA, amino acid charging, codon recognition and decoding, structure of ribosome, translation process (initiation, elongation, mRNA translocation and termination).  
(7<sup>th</sup> edition: Chapters 15, pp509-549, Chapter 16; 6<sup>th</sup> edition: Chapters 14-15)
6. Molecular mechanism of recombination (SLW)  
Inter-strand and double strand breaks. Models for homologous recombination. Genes and enzymes involved in homologous recombination.

(7<sup>th</sup> edition: Chapter 11, pp341-366; 6<sup>th</sup> edition: Chapter 10, pp 284-303, Chapter 11, pp 319-334)

7. DNA Damage, Mutagenesis and Repair Mechanisms (Chapter 10) (SZ)  
Types of DNA damage. Spontaneous and induced mutations. Mechanisms of DNA repair including base excision and nucleotide excision repair, transcription-coupled repair and recombination-based repair. Error-prone repair and mutagenesis.
8. Eukaryotic Chromosomes and Nucleosomes (Chapter 8) (SZ)  
Eukaryotic genome and chromosome structure. Chromatin, nucleosomes and their effect on transcription.
9. Eukaryotic DNA Replication and Telomeres (Chapter 8) (SZ)  
Chromosome duplication and segregation. Centromeres. Structure and function of telomeres. Mechanism of DNA replication. Replication of telomeres and telomerase.
10. Mechanisms of Eukaryotic Transcription (Chapter 13) (SZ)  
RNA polymerases I, II and III, the basic transcriptional machinery and transcription factors.
11. Gene Regulation in Eukaryotes (Chapters 19) (SZ)  
Regulatory transcription factors and families, enhancers, signal transduction pathways, silencing.
12. RNA Structure, Intron Splicing and Post-Transcriptional Processes (Chapters 5, 14) (SZ)  
The splicing pathway and mechanism. Alternative splicing. Self-splicing introns. RNA editing.
13. Regulatory RNA (Chapter 20) (SZ): RNAi, CRISPR-Cas, riboswitches and regulatory RNAs in bacteria and eukaryotes.

**Department Approval:**

Electronically Approved

**Date:** 2018-09-04 13:57

**Associate Dean's Approval for  
out of regular class-time  
activity:**

Electronically Approved

**Date:** 2018-09-05 12:35

## Course Outcomes

- describe basic structural features of DNA
- explain DNA topology, its physiological roles and correlations with mesophilic and thermophilic organisms
- explain essential biological processes including DNA replication, transcription, translation (mainly prokaryotes) and homologous recombination at molecular level
- explain mechanisms of positive and negative regulation of gene expression in prokaryotes
- explain the types of DNA damage and mutagenesis, and the mechanisms by which cells detect and repair them
- describe the organization of eukaryotic genomes, including chromatin structure, and compare how eukaryotic replication differs from prokaryotic replication
- describe the mechanism of transcription in eukaryotes and the various mechanisms by which genes are regulated, and compare these with regulation of bacterial genes
- describe the mechanisms of splicing and RNA-based regulatory mechanisms that occur in eukaryotes