

Department of Biochemistry Course Syllabus for Fall 2022 Biochemistry 3382A – Biochemical Regulation

The Department of Biochemistry recognizes diversity of identity and experience as a source of strength that promotes excellence, innovation, flexibility and adaptability in our discipline. We embrace, nurture, value and celebrate this diversity.



Western University is committed to a **thriving campus**; therefore, your health and wellness matter to us! The following link provides information about the resources available on and off campus to support students: <u>https://www.uwo.ca/health/</u> Your course coordinator can also **guide you** to resources and/or services should you need them.

1. Technical Requirements



Stable internet connection



Laptop or computer





*Working webcam - optional

* Instruction at Western this year will be in person. If the pandemic requires a shift to remote learning, then lectures and student presentations to be given online. A microphone and webcam will then be required for remote learning in this course.

2. Important Dates



Classes Begin	Classes End
Thursday, September 8, 2022	Thursday, December 8, 2022
* November 12, 2022: Last day to drop a first-term h	alf course without academic penalty

Reading Week	Study day(s)	Exam Period
October 31–November 6	December 9	December 10–22

3. Contact Information

Instructor(s)	Contact Information	Office
Dr. Brian Dempsey, he/him (course coordinator)	brian.dempsey@uwo.ca	MSB 389
Dr. Derek McLachlin, he/him	dmclach3@uwo.ca	MSB 349
Dr. John Capone, he/him	jpc@uwo.ca	WIRB 3182



Teaching Assistant(s)	Contact Information
Mahsa Farmanbar, she/her	mfarmanb@uwo.ca
Kurt Loedige, he/him	kloedige@uwo.ca
Alexa White, she/her	awhit265@uwo.ca

4. Course Description and Design

Delivery Mode: in-person

An organism or cell must be able to regulate itself to coordinate numerous processes, respond to changes in its environment, and grow and differentiate in an orderly manner. One of the main objectives of this course is to introduce various biochemical mechanisms involved in cellular regulation. The first series of lectures deals with the structure, dynamics, replication and repair of DNA – essential cellular processes that ensure faithful transmission of genetic material from generation to generation. The second set of lectures introduces key concepts in protein-DNA interactions, and how these interactions are crucial for regulating transcription of genes in both prokaryotes and eukaryotes. The third set of lectures of the course delves into cellular mechanisms that regulate mRNA abundance and stability. The last set of lectures will integrate topics into a discussion of synthetic biology and biotechnology. Specific case studies addressing how synthetic biology can be used for biotechnology and to benefit human health will be discussed in class.

Prerequisites: A minimum mark of 65% in either Biochemistry 2280A or Biochemistry 2288A; a minimum mark of 60% in either Chemistry 2213A/B or Chemistry 2273A; and a minimum mark of 60% in either Chemistry 2223B or Chemistry 2283G.

Component	Day	Time	Location		
lecture	Tues/Thurs				
lecture	Fri				
tutorial: student presentations	Tues				

Timetabled Sessions

Dav/Dates

Tue (Sept. 13 – Dec. 6)

Tue (Sept. 13 – Dec. 6)

Tue (Nov. 9 - Dec. 9)

Office Hours

Dr. McLachlin

Dr. Dempsey

Dr. Capone

0	Asynchronous	pre-work	will b	e required	before	some	class	sessions,	as	directed	by	the
	instructors											

Time

2:30 - 4:30 pm

1:30 - 3:30 pm

1:30 - 3:30 pm

Location

MSB 349

MSB 389

WIRB 3182

- Attendance at lecture sessions is required. Students must attend only the scheduled tutorial session in which they are scheduled to give their presentation.
- When possible audio recording will be provided for the lecture sessions.

All course material will be posted to OWL: http://owl.uwo.ca. Any changes will be indicated on the OWL site and discussed with the class. If students need assistance, they can seek support on the <u>OWL Help page</u>. Alternatively, they can contact the <u>Western Technology Services Helpdesk</u>. They can be contacted by phone at 519-661-3800 or ext. 83800. <u>Google Chrome</u> or <u>Mozilla</u> <u>Firefox</u> are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click <u>here</u>.

In the event of a need to move to online learning, all course content will be distributed through OWL, this includes lectures and all assessments. Online learning will require, a stable internet connection with working microphone and webcam. The 3382A course grading scheme will not need to be altered for online learning. The decision to move to online learning will be made by Western, and not individual instructors or departments (excepting temporary online instruction in the event of instructor illness).

5. Learning Outcomes

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

- 1. describe the different types of structures formed by nucleic acids, and make predictions about how biochemical processes and changes in sequence and environment affect nucleic acid structure, stability, supercoiling, and metabolism
- 2. with reference to specific proteins, explain the biochemical mechanisms of DNA replication, recombination, and repair, and how these processes are regulated
- 3. describe the different DNA repair mechanisms, and how defects in DNA repair pathways can cause human diseases
- 4. explain the key molecular components of transcription, including both DNA and proteins, and be able to formulate strategies to control gene expression with these components
- 5. describe the RNA-based mechanisms used for genome defense in both bacteria and eukaryotes, and how these mechanisms have been adapted for use as genome-editing tools
- 6. describe the different mechanisms that control mRNA turnover, stability and decay in eukaryotic cells, and be able to explain differences between cis- and trans-acting factors that control mRNA expression levels
- 7. formulate general strategies for cloning and expressing genes based on the different types of restriction endonucleases used in recombinant DNA technologies
- 8. formulate general strategies using techniques of synthetic biology to accomplish defined biotechnological goals
- 9. analyze and draw conclusions from experimental data generated by techniques commonly used in biochemistry
- 10. orally present the results and significance of biochemistry experiments to a scientific audience
- 11. write a summary of a set of biochemistry experiments, targeting either a scientific or lay audience

6. Course Content and Schedule

Week	Dates	Торіс	Instructor	
1	Sept 8–11	Introduction Dempsey		
2	Sept 12-18	Nucleic Acid Structure/Supercoiling**	McLachlin	
3	Sept 19-25	Nucleotide Metabolism**	McLachlin	
4	Sept 26–Oct 2	DNA Replication**/DNA Damage & Repair	McLachlin/Dempsey	
5	Oct 3–9	DNA Repair/Protein-DNA Interactions	Dempsey	
6	Oct 10–16	Protein DNA Interactions	Dempsey	
7	Oct 17–23	Regulation of Transcription	Dempsey	
8	Oct 24-Oct 30	Prokaryotic Regulation of Transcription	Dempsey	
9	Oct 31–Nov 6	Reading Week	N/A	
10	Nov 7–13	Eukaryotic Regulation of Transcription	Capone	
11	Nov 14–20	Eukaryotic Transcription	Capone	
12	Nov 21–27	Chromatin and Gene Regulation	Capone	
13	Nov 28–Dec 4	Genome Editing & Synthetic Biology	Capone	
14	Dec 5–8		Review/Presentations	

* The relationship between topics and dates is approximate; instructors may adjust the schedule during the course.

** Videos will be assigned for students to watch before these class sessions.



Student presentations

Dates	Activity	Topics
Tues. Sep 13	No presentations	
Tues. Sep 20	No presentations	
Tues. Sep 27	No presentations	
Tues. Oct 4	Student presentations	McLachlin
Tues. Oct 11	Student presentations	McLachlin
Tues. Oct 18	Student presentations	McLachlin
Tues. Oct 25	Student presentations	Dempsey
Tues. Nov 1	No presentations – Reading Week	
Tues. Nov 8	Student presentations	Dempsey
Tues. Nov 15	Student presentations	Dempsey
Tues. Nov 22	Student presentations	Dempsey
Tues. Nov 29	Student presentations	Capone
Tues. Dec 6	Student presentations	Capone
Tues. Dec 6	Student presentations – In Class	Capone

Instructions for scheduling student presentations are given separately.

7. Evaluation

Below is the evaluation breakdown for the course. Any deviations will be communicated.

Assessment	Format	Weight (%)	Due Date
Assignment 1	Short answer	10	Tues. Oct 4
Assignment 2	Short answer	10	Tues. Oct 25
Assignment 3	Short answer	10	Fri. Nov 25
Oral presentation	10-min team presentation	15.0	Various
Scientific summary	Short essay	7.5	Various
Lay summary	Short essay	7.5	Various
Final exam	Short and long answer	40.0	TBD

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- All written assignments will be submitted to Turnitin via OWL and Gradescope.ca. Students are responsible for ensuring for all assessment submissions that the correct file version is uploaded; incorrect submissions including corrupt files could be subject to late penalties (see below) or a zero.
- For the team-based presentation and summaries a student may not receive the same grade as their group members if it is determined that the distribution of work was not equal
- After an assessment is returned, students should wait 24 hours to digest feedback before contacting their evaluator with any questions; to ensure a timely response, reach out within 7 days
- Any grade appeals on marked work or final grades must be received within 2 weeks of the mark or grade being posted.

Assignments will consist mainly of data analysis or application questions. Some questions on the final exam will resemble the assignment questions in style. <u>Assignments will be posted to</u> <u>OWL and must be submitted to Gradescope.ca</u> **and** to Turnitin via OWL by 11:55 pm on the <u>indicated date</u>. Students will not be able to view the Turnitin report for their assignment submissions.

Oral presentations will be given in teams assigned by the instructors. Briefly, each team will choose a published paper from a provided list, and will sign up to give a 10-minute oral presentation summarizing the contents and significance of the paper.

One week after their oral presentation, each team will submit a **scientific summary** and a **lay summary** of their chosen paper. The 500- to 750-word scientific summary will be in the style of a *Nature* News and Views article targeted to a general audience of scientists. The 300- to 500-word lay summary will be in the style of a news article targeted to the general public. These summaries should be submitted to Gradescope.ca **and** to Turnitin via OWL by 5:30 pm one week after the team's oral presentation. Groups will be able to view the Turnitin reports for their summaries.

Detailed instructions for the oral presentations and written summaries, including marking rubrics and details of peer assessment, are provided in a separate document.

The **final exam** will cover the entire course and will consist of short- and long-answer questions and problems based on lecture material. The final exam will take place during the December exam period as scheduled by the Registrar's Office.

Late or missed evaluations. We will accept late assignments up to 48 hours past the due date, but will deduct 10% for every 24 hours unless an academic consideration is received. If an academic consideration is obtained, the student must immediately contact Dr. Dempsey to discuss a revised due date.

An assignment cannot be submitted after it has been returned to the class. If the length of a student's academic consideration period prevents them from submitting the assignment before it is returned to the class, then the weight of that assignment will be transferred to the final exam.

As stated above, teams must submit their written summaries one week after they give their presentation. However, if extraordinary circumstances arise that prevent submission of a summary all teams are automatically granted a 48-hour grace period without penalty. For example: a team presents on Oct 4 and their summaries are due on Oct 11, but a situation arises that prevents them from submitting on that day. The team may submit their summaries up until Thurs Oct 13 at 5:30 pm without a late penalty.

Individual students who miss their team's oral presentation will be required to give a presentation relating to a different paper on a later date. They may still contribute to their team's original written summaries.

Click <u>here</u> for a detailed and comprehensive set of policies and regulations concerning examinations and grading. The table below outlines the University-wide grade descriptors.

A+	90-100	One could scarcely expect better from a student at this level
Α	80-89	Superior work which is clearly above average
В	70-79	Good work, meeting all requirements, and eminently satisfactory
С	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

INC (Incomplete Standing): If a student has been approved by the Academic Counselling Office (in consultation with the instructor/department) to complete term work at a later date, an INC will be assigned. Students with INC will have their course load in subsequent terms reduced to allow them to complete outstanding course work. Students may request permission from Academic Counselling to carry a full course load for the term the incomplete course work is scheduled.

SPC (**Special examination**): If a student has been approved by the Academic Counselling Office to write a Special Examination and the final exam is the only outstanding course component, an SPC will be assigned. If the class has a makeup exam, the student is expected to write the makeup exam. If the class doesn't have a makeup exam or the student misses the makeup exam for reasons approved by the Academic Counselling Office, the student will write the exam the next time the course is offered. Outstanding SPCs will reduce the course load for the term the exam is deferred as outlined in <u>Types of Examinations</u> policy.

8. Communication



Information and announcements related to the course will be communicated through OWL or using a student's Western University email address. Students are expected to check the OWL site regularly and their email at least every 24-48 hours. This course will use the OWL Forum for all course-related queries so that everyone can access the queries and responses. For confidential matters, students may email the instructors or TAs directly. Posts to the forum or emails will receive a response within 2 business days, if not sooner.

9. Resources



No textbook is required. Students may wish to consult papers cited in class to achieve a fuller understanding of course material. Slides used in class or videos to be watched before class will be posted to OWL ahead of time, and we plan to post audio recordings of class sessions.

The book "Writing in the Biological Sciences", 4th ed., by Angelika Hofmann (PB ISBN: 9780197543580), is recommended for advice on preparing written work and oral presentations in this course, as well as Biochem 3381A and Biochem 3380G. Print and ebook versions should be available through the bookstore.

10. Professionalism & Privacy



Western students are expected to follow the <u>Student Code of Conduct</u>. All course materials created by instructors or TAs are copyrighted and cannot be sold or shared. Recordings are not permitted without explicit permission. Posted recordings are not to be distributed.

Western is committed to providing a learning and working environment that is free of harassment and discrimination. All **students**, staff, and faculty have a role in this commitment and have a responsibility to ensure and promote a safe and respectful learning and working environment. Relevant policies include Western's <u>Non-Discrimination/Harassment Policy</u> and <u>Non-Discrimination/Harassment Policy</u> – <u>Administrative Procedures</u>.

Any **student**, staff, or faculty member who experiences or witnesses' behaviour that may be harassment or discrimination **must report the behaviour** to the Western's <u>Human Rights Office</u>. Harassment and discrimination can be human rights-based, which is also known as EDI-based, (*e.g.*, sexism, racism, transphobia, homophobia, islamophobia, xenophobia, antisemitism, or ableism) or non-human rights-based (personal harassment or workplace harassment).

11. How to Be Successful in this Class

Students enrolled in this class should understand the level of autonomy and self-discipline required to be successful.

- 1. Invest in a planner or application to keep track of your courses. Populate all your deadlines at the start of the term and schedule your time throughout the course.
- 2. Make it a daily habit to log onto OWL to ensure you have seen everything posted to help you succeed in this class.
- 3. Create weekly checklists to help you stay on track with course activities.
- 4. Take notes as you go through the lesson material. Keeping handwritten notes or even notes on a regular Word document will help you learn more effectively than just reading or watching lectures.
- 5. Connect with others. Try forming a study group (in person or online) and try meeting on a weekly basis for study and peer support.
- 6. Do not be afraid to ask questions. If you are struggling with a topic, check the OWL Forum or contact your instructors and or teaching assistants.
- 7. Reward yourself for successes. It seems easier to motivate ourselves knowing that there is something waiting for us at the end of the task.

12. Western Academic Policies and Statements

Absence from Course Commitments

A. Absence for medical illness:

Students must familiarize themselves with the Accommodation for Illness Policy.

A student seeking academic accommodation for any **work worth less than 10%** (Presentation Summaries) should review the instructions provided on the course outline (grace period). Instructors will use good judgment and ensure fair treatment for all students in these situations. You are not required to disclose details about your situation to your instructor; documentation is not required in this situation, and you should not send any pictures to your instructor.

If you are unable to meet a course requirement for any **work worth 10% or greater** due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Academic Counseling as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. Please note that the format of a make-up test, exam, or assignment is at the discretion of the course coordinator.

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found at: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

B. Absence for non-medical reasons:

Student absences might also be approved for non-medical reasons such as religious holidays and compassionate situations. Please review the policy on <u>Accommodation for Religious Holidays</u>. All non-medical requests must be processed by Academic Counselling. Not all absences will be approved; pay attention to the academic calendar and final exam period when booking any trips.



C. Special Examinations

A Special Examination is any examination other than the regular examination, and it may be offered only with the permission of the Dean of the Faculty in which the student is registered, in consultation with the instructor and Department Chair. Permission to write a Special Examination may be given on the basis of compassionate or medical grounds with appropriate supporting documents. To provide an opportunity for students to recover from the circumstances resulting in a Special Examination, the University has implemented Special Examinations dates. These dates as well as other important information about examinations and academic standing can be found here.

Academic Offenses

Scholastic offences are taken seriously, and students are directed <u>here</u> to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence.

Accessibility Statement

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Accessible Education (AE) at 661-2111 x 82147 for any specific question regarding an accommodation or review <u>The policy on Accommodation for Students with Disabilities</u>

Correspondence Statement

The centrally administered **e-mail account** provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner. You can read about the privacy and security of the UWO email accounts <u>here</u>.

Discovery Credit Statement

Students are permitted to designate up to 1.0 Discovery Credit course (or equivalent) for pass/fail grading that can be counted toward the overall course credits required for their degree program. The details of this policy and the deadlines can be found <u>here</u>.

Turnitin and other similarity review software

All assignments will be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between Western University and <u>Turnitin.com</u>.

13. BMSUE Academic Policies and Statements

Cell Phone and Electronic Device Policy (for in-person tests and exams)

The Schulich School of Medicine & Dentistry is committed to ensuring that testing and evaluation are undertaken fairly across all our departments and programs. For all tests and exams, it is the policy of the School that any electronic devices, i.e., cell phones, tablets, cameras, or iPod are strictly prohibited. These devices MUST be left either at home or with the student's bag/jacket at the front of the room and MUST NOT be at the test/exam desk or in the individual's pocket. Any student found with one of these prohibited devices will receive a grade of zero on the test or exam. Non-programmable calculators are only allowed when indicated by the instructor. The program is not responsible for stolen/lost or broken devices.

Copyright and Audio/Video Recording Statement

Course material produced by faculty is copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws. You must always ask permission to record another individual and you should never share or distribute recordings.

Rounding of Marks Statement

Across the Basic Medical Sciences Undergraduate Education programs, we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. *Final grades* on this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g., a 79 will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved, and the mark assigned; requests for mark "bumping" will be denied.

14. Support Services

The following links provide information about support services at Western University.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Academic Counselling (Science and Basic Medical Sciences)

Appeal Procedures

Registrarial Services

Student Development Services

Student Health Services