

Physiology and Pharmacology
Molecular and Structural Basis of Drug Action: Pharmacology 4620A

Course outline for Fall 2020



Although this academic year might be different, Western University is committed to a **thriving campus**. We encourage you to check out the [Digital Student Experience](#) website to manage your academics and well-being. Additionally, the following link provides available resources to support students on and off campus: <https://www.uwo.ca/health/>.

1. Technical Requirements:



Stable internet connection



Laptop or computer



Working microphone



Working webcam

2. Course Overview and Important Dates:



Delivery Mode	Dates	Time
Online	T	2.30 PM ET

*Details about design and delivery of the course are listed below in Section 4

Classes Start	Reading Week	Classes End	Study day(s)	Exam Period
September 9	November 2 - 8	December 9	December 10	December 11 - 22

* November 12, 2020: Last day to drop a first-term half course or a first-term full course without penalty

3. Contact Information

Course Coordinator	Contact Information
Rithwik Ramachandran	rramach@uwo.ca



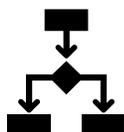
Instructor(s) or Teaching Assistant(s)	Contact Information
Dr. Rithwik Ramachandran	rramach@uwo.ca, x82142
Dr. Peter Stathopoulos	pstatho@uwo.ca, x83238

4. Course Description and Design

This course will present an overview of the drug discovery process and introduce the principal mechanisms of action at the molecular and structural levels of the major receptor, ion channel, exchanger and other protein families which drive crucial cell signaling processes in health and disease and are important drug targets. Mechanisms of pharmacological intervention as well as drug design concepts will be discussed as treatment strategies to correct dysfunctional signaling pathways. Students will have an opportunity to explore protein-drug interactions using molecular viewing software and prepare short video presentations of their favourite pathways as an assignment contributing to their final grade, also made up of midterm and final exams.

Prerequisite(s): One of Pharmacology 3620, Physiology 3140A, Biochemistry 3381A or Departmental permission.

Mode	Dates	Time	Frequency
Virtual synchronous	T	2.30 PM ET	weekly
Virtual asynchronous	N/A	2 hours	weekly



- Asynchronous pre-work must be completed 1 day prior to synchronous sessions
- Attendance at some synchronous sessions is required, see course content in section 6.
- Missed work should be completed within 24 hours
- A recording will be provided for synchronous sessions
- Closed captioning will be provided on audio or video recordings if requested

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. Lecture related papers that are required reading will be uploaded as pdf files to OWL.

If students need assistance, they can seek support on the [OWL Help page](#). Alternatively, they can contact the [Western Technology Services Helpdesk](#). They can be contacted by phone at 519-661-3800 or ext. 83800.

[Google Chrome](#) or [Mozilla Firefox](#) are the preferred browsers to optimally use OWL; update your browsers frequently. Students interested in evaluating their internet speed, please click [here](#).

5. Learning Outcomes

Objectives:

This course will present mechanisms of major druggable receptor, ion channel, exchanger and other protein actions that drive cell signaling processes in health and disease. Pharmacological interventions and drug design will be discussed in relation to dysfunctional cell signalling pathways and available protein structure information.



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

- (a) Identify the major classes of protein drug targets and explain how the related signaling pathways function in health and become dysfunctional in disease.
- (b) Explain the molecular and structural bases for specific protein-drug interactions.
- Apply learning outcomes a) and b) to conceptually develop new drugs for disease treatment.

6. Course Content and Schedule

Week	Dates	Topic	Instructor
1	Sept 14 – 20	Introduction / drug discovery and delivery / protein structure / PyMOL – downloading and installing.	RR and PS
2	Sept 21 – 27	ADMET, Pharmacokinetics and Pharmacodynamics	RR
3	Sept 28 – Oct 4	G-Protein Coupled Receptors (GPCR), structure, activation	RR
4	Oct 5 – 11	GPCR signaling, desensitization, trafficking	RR
5	Oct 12 – 18	Receptor Tyrosine Kinases and Kinases	RR
6	Oct 19 – 25	GTPase structure and function: GEFs, GAPs, GDIs, membrane association; drugging GTPases in disease / PyMOL – visualizing protein structure and alignment	PS
		MID TERM EXAM October 26th, 2020	
7	Oct 26 – Nov 1	Ungated ion channel structure and function (K ⁺ channels); drugging K ⁺ channels in disease / PyMOL – visualizing biological assembly and measuring distances	PS
8	Nov 2 – 8	Reading Week	
9	Nov 9 – 15	Voltage and ligand gated ion channel structure and function (Ca ²⁺ sensing proteins, IP3R, RyR); drugging RyRs in disease / PyMOL – visualizing protein surface charges - I	PS
10	Nov 16 – 22	Cotransporter/exchanger structure and function (Na ⁺ /Ca ²⁺ exchanger NCX proteins); pharmacological modulation of NCX activity / PyMOL – visualizing protein surface charges - II	PS
11	Nov 23 – 29	Active transporter/pump structure and function (V, F, P-type ATPases); small molecule targeting of ATPases / PyMOL – viewing protein structures in stereo	PS
12	Nov 30 – Dec 6	Video Presentations and Discussion (Virtual synchronous session Attendance required)	RR and PS
13	Dec 7 – 9	Video Presentations and Discussion (Virtual synchronous session Attendance required)	RR and PS
14	Dec 11-22	FINAL EXAM	



7. Online Participation and Engagement



- Students are expected to participate and engage with content as much as possible
- Students participation in Virtual synchronous session during Week 1-11 is highly encouraged. Students may post on OWL forums after watching the recording as an alternative method of discussion.
- Students are required to attend Virtual synchronous session during Week 12-13
- Students can also participate by interacting in the forums with their peers and instructors

8. Evaluation

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

Assessment	Format	Weighting	Due Date
Lecture Quiz	OWL Quiz	10	Weekly
Mid Term Exam (Topic 1-5)	Take home exam	35	October 26 th , 2020, 6-9 PM
Final Exam (Topic 5-10)	Take home exam	35	TBA
Assignment	Online video and discussion	20	Friday, Nov 27 th 2020

- All assignments are due at 11:55 PM ET unless otherwise specified
- Lecture related quizzes will appear on OWL weekly and will consist of 3-5 multiple choice questions.
- Written assignments or exams will be submitted to Turnitin (statement in policies below)
- Students will have unlimited submissions to Turnitin
- Rubrics will be used to evaluate assessments and will be posted with the instructions (see assignment description)
- After an assessment is returned, students should wait 24 hours to digest feedback before contacting their evaluator; to ensure a timely response, reach out within 7 days



Click [here](#) 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
A	80-89	Superior work which is clearly above average
B	70-79	Good work, meeting all requirements, and eminently satisfactory
C	60-69	Competent work, meeting requirements
D	50-59	Fair work, minimally acceptable
F	below 50	Fail

Information about late or missed evaluations:

- Late assessments without documentation or a self-reported absence will be subject to a late penalty 10 %/day
- Late assessments with a self-reported absence should be submitted within 24 hours of the last day of the self-report
- An assessment cannot be submitted after it has been returned to the class; an alternate assessment will be assigned.
- A make-up test will be offered for mid-term and final exams.
- If a make-up assessment is missed, the student will receive an INC and complete the task the next time the course is offered

9. Communication:



- Students should check the OWL site every 24 – 48 hours
- Update and reminders will be provided on the OWL announcements
- Students can email the instructor(s) directly at the address listed in section 3.
- Emails will be monitored daily; students will receive a response in 24 – 48 hours
- This course will use Zoom for Virtual Synchronous sessions
- This course will use the OWL forum for discussions
- Students should post all course-related content on the discussion forum so that everyone can access answers to questions
- The discussion forums will be monitored daily by instructors

10. Office Hours:



- Office hours will be held using Zoom after Virtual synchronous session Tue 2.30PM - 4.30PM
- Students will be able to schedule an office hour appointment by emailing instructors

11. Resources



- All resources, links and reading material will be posted in OWL. Lecture related papers that are required reading will be uploaded as pdf files to OWL.
- There are no required textbooks for this course, but the following books may be useful
Molecular Pharmacology: from DNA to Drug Discovery; Dickenson et al., ISBN: 978-0-470-68443-6, Biochemical Pharmacology; Palmer et al., ISBN: 978-0-470-17445-6, Pharmacology; Rang and Dale, ISBN: 978-0-702-05497-6, The pharmacological basis for therapeutics, Goodman and Gilman, ISBN: 978-0071624428.

12. Professionalism & Privacy:



Western students are expected to follow the [Student Code of Conduct](#). Additionally, the following expectations and professional conduct apply to this course:

- Students are expected to follow online etiquette expectations provided on OWL
- All course materials created by the instructor(s) are copyrighted and cannot be sold/shared
- Recordings are not permitted (audio or video) without explicit permission
- Permitted recordings are not to be distributed
- Students will be expected to take an academic integrity pledge before some assessments
- All recorded sessions will remain within the course site or unlisted if streamed

13. 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 time at the start of each week to get organized and manage your time.

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. Follow weekly checklists created on OWL or create your own to help you stay on track.
4. Take notes as you go through the lesson material. Treat this course as you would a face-to-face course. Keeping handwritten notes or even notes on a regular Word document will help you learn more effectively than just reading or watching the videos.
5. Connect with others. Try forming an online study group 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 online discussion boards or contact your instructor(s) and or teaching assistant(s).
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.

14. Western Academic Policies and Statements

Absence from Course Commitments

[Policy on Academic Consideration for Student Absences](#)

If you are unable to meet a course requirement due to illness or other serious circumstances, you must seek approval for the absence as soon as possible. Approval can be granted either through a **self-reported absence** or via the **Academic Counselling** unit. Students have two self-reports to use throughout the academic year; absence from course commitments including tests, quizzes, presentations, labs, and assignments that are worth 30% or less can be self-reported. Self-reported absences cover a student for 48 hours (yesterday + today or today + tomorrow). Your instructor will receive notification of your consideration; however, you should contact your instructor immediately regarding your absence. Students are expected to submit missed work within 24 hours of the end of the 48-hour period. Please review details of the [university's policy on academic consideration for student absences](#).

If you have used both their self-reported absences or will miss more than 48 hours of course requirements, a Student Medical Certificate (SMC) should be signed by a licensed medical or mental health practitioner and you should contact academic counselling. Academic Counselling will be operating virtually this year and can be contacted at scibmsac@uwo.ca.

Accommodation for Religious Holidays

The policy on Accommodation for Religious Holidays can be viewed [here](#).

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 Offences

"Scholastic offences are taken seriously, and students are directed [here](#) 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 [The policy on Accommodation for Students with Disabilities](#).

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 [here](#).

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. Students will be able to view their results before the final submission. 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 [Turnitin.com](#).

15. 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.

16. Support Services

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

[Academic Counselling \(Science and Basic Medical Sciences\)](#)

[Appeal Procedures](#)

[Registrarial Services](#)

[Student Development Services](#)

[Student Health Services](#)