Physiology 3140A: Cellular Physiology  
Fall Term 2018

Course Coordinator  
Dr. John Di Guglielmo  
john.diguglielmo@schulich.uwo.ca

Instructors  
Dr. John Di Guglielmo (J.D.; john.diguglielmo@schulich.uwo.ca)  
Dr. Michael Poulter (M.P.; mpoulter@uwo.ca)  
Dr. Jane Rylett (J.R.; Jane.Rylett@schulich.uwo.ca)  
Dr. Christopher Pin (C.P.; cpin@uwo.ca)

TAs  
Kevin Nixon  
Matthew Novello  
Stephen Sherman  
Tyler Cooper

Overview  
Physiology 3140A is a half-course to introduce students to the basic concepts of cellular and molecular physiology and some of the molecular tools used in the field.

Course Objectives:  
By the end of the course, successful students will be able to  
1) Examine the basic principles involved in cellular physiology  
2) Explain intercellular and intracellular communication of biological information  
3) Identify and describe experimental approaches and techniques used to study cellular communication.

Perturbations to the intracellular and extracellular environments of the cell will be selected to illustrate physiological responses to stimuli.

The course consists of 5 modules:  
a) Cell architecture and membrane transport (J.D.)  
b) Cellular electrophysiology including ion channels and resting membrane potential (M.P.)  
c) G-protein coupled receptors and enzyme-linked receptors (J.R.)  
d) Cellular signaling by cAMP, PKA, NO, Ca^{+2}, PKC and lipid mediators (J.R.)  
e) The nucleus and gene regulation (C.P.)
Each instructor will post his or her lecture slides prior to the lecture. The course materials are from multiple sources, including textbooks and scientific literature. There are no required textbooks for the course. The figures used by each lecturer will be referenced in the slides.

**Lectures:** Monday, Wednesday, and Friday, 9:30-10:30 a.m.

**Room:** HSB40

**Prerequisite(s):** It is strongly recommended that Biochemistry 2280A and Biology 2382B be taken prior to Physiology 3140A.

**Senate regulation regarding the student’s responsibility regarding requisites:**
Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

**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 Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.*

**OWL:**
**Tutorials**
There are no formal tutorials in this course.

**Forums**
You will be able to post questions on OWL, which will be answered by the TAs and/or course instructors. Also, supplementary lecture materials, molecular tools and quizzes, sample examination questions, and your examination grades will be posted on OWL.

Students with OWL issues should see: https://owl.uwo.ca/portal/site/owldocs
# Course Syllabus

## CELLULAR PHYSIOLOGY

### 2018 Lecture Schedule

Lectures: Monday, Wednesday, and Friday, 9:30-10:30 a.m.  
Room: HSB40

<table>
<thead>
<tr>
<th>Date</th>
<th>Lec</th>
<th>Instructor</th>
<th>Topic</th>
<th>Online Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sept</td>
<td>7</td>
<td>J.D.</td>
<td>Course Introduction/Overview of Cell Physiology</td>
<td></td>
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<tr>
<td></td>
<td>10</td>
<td>J.D.</td>
<td>Integrating Cells into Tissues</td>
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<tr>
<td></td>
<td>12</td>
<td>J.D.</td>
<td>Cell-Matrix Interactions I</td>
<td>Immunofluorescence Microscopy (IF)</td>
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<tr>
<td></td>
<td>14</td>
<td>J.D.</td>
<td>Cell-Matrix Interactions II</td>
<td>IF Quiz completed</td>
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<tr>
<td></td>
<td>17</td>
<td>J.D.</td>
<td>Cell-Cell Interactions</td>
<td></td>
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<tr>
<td></td>
<td>19</td>
<td>J.D.</td>
<td>Epithelial Cell Polarity/ Properties of Epithelial Cells</td>
<td></td>
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<tr>
<td></td>
<td>21</td>
<td>J.D.</td>
<td>Transport Across Epithelium</td>
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<tr>
<td></td>
<td>24</td>
<td>J.D.</td>
<td>Cytoskeleton/Scaffolding Proteins</td>
<td>Western Blot (WB)</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>J.D.</td>
<td>Membrane Properties/ Lipid Bilayer</td>
<td>WB Quiz completed</td>
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<tr>
<td></td>
<td>28</td>
<td>J.D.</td>
<td>Membrane Rafts/ Signalling Platforms</td>
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<tr>
<td>Oct</td>
<td>1</td>
<td>J.D.</td>
<td>Review Session</td>
<td></td>
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<tr>
<td></td>
<td>3</td>
<td>M.P.</td>
<td>Ion Channels</td>
<td></td>
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<tr>
<td></td>
<td>5</td>
<td>M.P.</td>
<td>Molecular Structure of Ion Channels</td>
<td></td>
</tr>
</tbody>
</table>
|      | 8   | M.P.       | Thanksgiving Monday  
No Lecture | |
|      | 10  | M.P.       | Fall Study Break  
No Lecture | |
|      | 12  | M.P.       | Fall Study Break  
No Lecture | |
<p>|      | 15  | M.P.       | Patch Clamp Method, Ionic Distribution and Nernst Equation | |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Day</th>
<th>Lecturer</th>
<th>Topic</th>
</tr>
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<tbody>
<tr>
<td>17</td>
<td>Wed</td>
<td>M.P.</td>
<td>Resting Membrane Potential</td>
</tr>
<tr>
<td>19</td>
<td>Fri</td>
<td>J.R.</td>
<td>Cell Signalling Introduction</td>
</tr>
<tr>
<td>22</td>
<td>Mon</td>
<td>J.R.</td>
<td>Receptor signalling classes</td>
</tr>
<tr>
<td>24</td>
<td>Wed</td>
<td>J.R.</td>
<td>G protein-coupled receptors I</td>
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<td></td>
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<td></td>
<td><strong>Midterm: Thursday, October 25</strong></td>
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<td></td>
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<td></td>
<td><strong>7:00-9:00 PM</strong></td>
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<tr>
<td>26</td>
<td>Fri</td>
<td>J.R.</td>
<td>G protein-coupled receptors II</td>
</tr>
<tr>
<td>29</td>
<td>Mon</td>
<td>J.R.</td>
<td>Enzyme Coupled Receptors I</td>
</tr>
<tr>
<td>31</td>
<td>Wed</td>
<td>J.R.</td>
<td>Enzyme Coupled Receptors II RNAi</td>
</tr>
<tr>
<td>Nov</td>
<td></td>
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<tr>
<td>2</td>
<td>Fri</td>
<td>J.R.</td>
<td>Cyclic Nucleotides – cAMP/PKA I RNAi Quiz completed</td>
</tr>
<tr>
<td>5</td>
<td>Mon</td>
<td>J.R.</td>
<td>Cyclic Nucleotides – cAMP/PKA II</td>
</tr>
<tr>
<td>7</td>
<td>Wed</td>
<td>J.R.</td>
<td>Cyclic Nucleotides – cGMP</td>
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<tr>
<td>9</td>
<td>Fri</td>
<td>J.R.</td>
<td>Nitric Oxide</td>
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<tr>
<td>12</td>
<td>Mon</td>
<td>J.R.</td>
<td>PDE</td>
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<tr>
<td>14</td>
<td>Wed</td>
<td>J.R.</td>
<td>Lipid derived mediators PCR</td>
</tr>
<tr>
<td>16</td>
<td>Fri</td>
<td>J.R.</td>
<td>Protein Kinase C PCR Quiz completed</td>
</tr>
<tr>
<td>19</td>
<td>Mon</td>
<td>J.R.</td>
<td>Ca+2 as a second messenger</td>
</tr>
<tr>
<td>21</td>
<td>Wed</td>
<td>C.P.</td>
<td>Transcription I</td>
</tr>
<tr>
<td>23</td>
<td>Fri</td>
<td>C.P.</td>
<td>Nuclear import and organization</td>
</tr>
<tr>
<td>26</td>
<td>Mon</td>
<td>J.R.</td>
<td>Arachadonic Acid Mouse models (MM)</td>
</tr>
<tr>
<td>28</td>
<td>Wed</td>
<td>C.P.</td>
<td>Transcription II MM Quiz completed</td>
</tr>
<tr>
<td>30</td>
<td>Fri</td>
<td>C.P.</td>
<td>Epigenetics I</td>
</tr>
</tbody>
</table>


Course Materials
Textbook: none
The course materials are from multiple sources, including textbooks and scientific literature. There are no required textbooks for the course. The figures used by each lecturer will be referenced in the slides.

Evaluation
Online quizzes (10%)
Midterm examination (35%)
Final examination (55%)

The format for the examinations will be ‘multiple choice’ with some short answer questions. Sample exam questions will be posted on OWL prior to the exams for practice.

Midterm Exam
Date: Thursday October 25, 19:00-21:00 (7:00-9:00 pm)
Make-Up Midterm Exam (for eligible students only)
Date: TBA

For room assignments, please consult Exam Information tab in the Course FAQs page of OWL

If you miss or expect to miss an examination, you should request approval (with appropriate documentation) from the counsellor of your Faculty. Afterwards, please contact Dr. Di Guglielmo to set up a make-up exam.

Note: it is the policy of the Department of Physiology and Pharmacology and the BMSec program in the Schulich School of Medicine and Dentistry to report the grade you earned in the course. Grades will not be “bumped”. For example, if your final grade is 78.45%, it will be entered as 79% and will not be “bumped” to 80%.

Additional Information/Statements

Statement on Use of Electronic Devices
Non-programmable calculators are required for exams. Phones and smart watches must remain in backpacks at the front of the exam room for the duration of the exams.

**Statement on Academic Offences**
“Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following website: http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf.”

Computer-marked multiple-choice tests may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

**Absence from course commitments**
If you miss or expect to miss an examination or online assignments/quizzes, you should request approval (with appropriate documentation) from the counsellor of your Faculty. Afterwards, please contact Dr. Di Guglielmo (for exams) or Dr. Anita Woods (for online assignments/quizzes) to set up a make-up exam/quiz/etc.

The Medical Accommodation Policy can be found at: https://studentservices.uwo.ca/secure/index.cfm.

Documentation for either medical or non-medical academic accommodation must be submitted by the student directly to the appropriate Faculty Dean’s/Academic Counselling office and not to the instructor. It will be the Dean’s/Academic Counselling office that will determine if accommodation is warranted.

**Absence for medical illness:**
Students must familiarize themselves with the Policy on Accommodation for Medical Illness for Undergraduate Students, located at:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

The policy is also accessible from the Medical Accommodation Policy link at: https://studentservices.uwo.ca/secure/index.cfm

**Statement from the Academic Counselling Office, Faculty of Science (for Science and BMSc students)**
If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Academic Counselling Office 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 by the Academic Counselling Office and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Academic Counselling Office immediately. For further information please see:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf
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: https://studentservices.uwo.ca/secure/index.cfm

**Absence for non-medical reasons:**
A clear indication of how non-medical absences from midterms, tutorials, laboratory experiments, or late essays or assignments, will be dealt with must be provided. If documentation is required, such documentation must be submitted by the student directly to the appropriate Dean’s/Academic Counselling Office and **not** to the instructor. It will subsequently be the Dean’s/Academic Counselling Office that will determine if accommodation is warranted.

Students who are in emotional/mental distress should refer to Mental Health@Western http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.

**Special Examinations**
A Special Examination is any examination other than the regular final examination, and it may be offered only with the permission of the Dean/Academic Counselling Office 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.

A Special Examination must be written at the University or an Affiliated University College no later than 30 days after the end of the examination period involved. To accommodate unusual circumstances, a date later than this may be arranged at the time permission is first given by the Dean/Academic Counselling Office of the Faculty. The Dean/Academic Counselling Office will consult with the instructor and Department Chair and, if a later date is arranged, will communicate this to the Office of the Registrar.

If a student fails to write a scheduled Special Examination, permission to write another Special Examination will be granted only with the permission of the Dean/Academic Counselling Office in exceptional circumstances and with appropriate supporting documents. In such a case, the date of this Special Examination normally will be the scheduled date for the final exam the next time the course is offered.

When a grade of Special (SPC) or Incomplete (INC) appears on a student's record, the notations will be removed and replaced by a substantive grade as soon as the grade is available.

**Policy on Plagiarism**
The Department of Physiology and Pharmacology strongly condemns plagiarism. Plagiarism is the “act or instance of copying or stealing another’s words or ideas and attributing them as ones own.” (Excerpted from Black’s Law Dictionary, West Group, 1999, 7th ed. Pg 1170 and the definition used by Western’s Scholastic Discipline document). Plagiarism can be intentional or unintentional and regardless of intent, is a scholastic offence. It should be noted that self-plagiarism, plagiarizing ones own words for multiple assignments is subjected to the same
penalty as plagiarizing another. Courses in Physiology and Pharmacology use turnitin, a similarity checking software embedded within OWL. We encourage all students to run their assignments through turnitin prior to submitting their reports for grading. Any report flagged as yellow (25-49% matching text), orange (50-74% matching text) or red (75-100% matching text) will be considered plagiarism (pending investigation by the instructor). It should be noted that a document could be plagiarized yet still pass the similarity check on turnitin.

The minimum penalty for a first time plagiarism offense of any kind is a grade of zero on the assignment. In addition, details of the offense will be forwarded to Dean’s office and stored. A second offence will carry a much stricter penalty in line with Western’s Scholastic Discipline policies http://www.westerncalendar.uwo.ca/2017/pg113.html

**Cell Phone and Device Policy**

The Department of Physiology and Pharmacology is committed to ensuring that testing and evaluation are undertaken fairly. For all tests and exams, it is the policy of the Department of Physiology and Pharmacology that any devices with a battery (e.g. cell phone, tablet, camera, watch, smart watch, ipod) are strictly prohibited. These devices MUST be left either at home or with the students bag/jacket at the front of the room and MUST not be at the test/exam desk or in the individuals 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 Department of Physiology and Pharmacology is not responsible for stolen/lost or broken devices.

**Appeals Policy**

The Department of Physiology and Pharmacology follows the Western University student academic appeals policy (http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#SubHeading_181). All appeals to individual graded course components must be submitted to the course instructor within 3 weeks of the grade being released. All final course grade appeals must be received by January 31 (1st term classes) or June 30 (2nd term half classes and full year classes). You must first appeal to the course manager. If this appeal is rejected, then you can appeal to the Undergraduate Chair of the Department of Physiology and Pharmacology (Brad.Urquhart@schulich.uwo.ca). If this appeal is rejected, you may then appeal to the Assistant Dean of the Bachelor of Medical Sciences Undergraduate Education Committee (Candace.Gibson@schulich.uwo.ca).

You must have suitable grounds for appeal which may include: 1) appeal on medical or compassionate grounds; 2) appeal based on extenuating circumstances beyond your control; 3) appeal based on bias, inaccuracy or unfairness. All appeals must be accompanied by a detailed explanation along with supporting documentation. You should submit your appeal as an e-mail with a single attachment. If you have multiple supporting documents, you should merge them into a single document.

**Support Services:**
Registrarial Services: http://www.registrar.uwo.ca
Academic Counselling (Science and Basic Medical Sciences):
http://www.uwo.ca/sci/undergrad/academic_counselling/index.html

USC Student Support Services:  http://westernusc.ca/services/

Student Development Services: http://www.sdc.uwo.ca

Student Health Services: http://www.shs.uwo.ca/

Students who are in emotional/mental distress should refer to Mental Health@Western http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of options about how to obtain help.