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 for Remote Learning (if necessary):

- Stable internet connection
- Laptop or computer
- Working microphone
- Working webcam

2. Course Overview and Important Dates:

<table>
<thead>
<tr>
<th>Delivery Mode</th>
<th>Dates</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-person and/or online*</td>
<td>Thursdays</td>
<td>2:30 - 4:20 pm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Classes Start</th>
<th>Reading Week</th>
<th>Classes End</th>
<th>Study Day</th>
<th>Exam Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 8</td>
<td>November 1 - 7</td>
<td>December 8</td>
<td>December 9</td>
<td>December 10-21</td>
</tr>
</tbody>
</table>

* November 12, 2021: Last day to drop a first-term half course or a first-term full course without penalty.

3. Contact Information:

<table>
<thead>
<tr>
<th>Course Co-Coordinators</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dean H. Betts</td>
<td>Use OWL message or <a href="mailto:dean.betts@schulich.uwo.ca">dean.betts@schulich.uwo.ca</a></td>
</tr>
<tr>
<td>Cheryle A. Seguin</td>
<td>Use OWL message or <a href="mailto:cheryle.seguin@schulich.uwo.ca">cheryle.seguin@schulich.uwo.ca</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching Assistant (TA)</th>
<th>Contact Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naziyah Rasiwala</td>
<td>Use OWL message or <a href="mailto:nrasiwal@uwo.ca">nrasiwal@uwo.ca</a></td>
</tr>
</tbody>
</table>
4. Course Description and Design:

Physiology 4510A: Understanding Pluripotency: The physiology of stem cell fate and function

Fall Term 2021

The fundamental goal of pluripotent stem cell biology is to understand how the self-renew and differentiation capabilities of these extraordinary cells are regulated to produce specialized cells capable of differentiating into a wide range of functional cell types. This course will examine a variety of current topics within the field of pluripotent stem cell physiology. In particular, we will focus on the basic biology of embryo-derived stem cells and their potency. We will briefly cover pre- and post-implantation embryo development, focusing on cell fate determination and the cell lines derived from these developmental stages. We will discuss how these embryo-derived cell lines are isolated and tested, what factors allow for their expansion, how they can be genetically manipulated and what intrinsic and extrinsic factors regulate their self-renewal and cellular differentiation characteristics. We will also discuss pluripotent stem cells derived by somatic cell nuclear transfer and cellular reprogramming technologies. An understanding of this physiology will enable students a thorough understanding of stem cell function and cell fate determination to assess whether regenerative medicine is feasible with pluripotent cells along with gaining the ability to critically evaluate the ethical issues that surround this field.

Requisites: Suggested Prerequisite(s): Physiology 3120, Physiology and Pharmacology 3000e and Physiology 3140A (or equivalent).

Delivery Mode:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Dates</th>
<th>Time</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-person lectures and modules*</td>
<td>Thursdays</td>
<td>2:30 - 4:20 pm</td>
<td>weekly</td>
</tr>
</tbody>
</table>

*Western Active Learning Space (WALS, Room 66 UCC)

☒ Asynchronous pre-work must be completed prior to synchronous sessions
☒ Attendance at synchronous (in-person/virtual) sessions is required
☒ Missed work should be completed within 48 hours
☒ A recording may be provided for synchronous sessions

NOTE: In the event of a COVID-19 resurgence during the course that necessitates moving away from face-to-face interaction, remaining course content will be delivered online, either synchronously (i.e., at times indicates in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online at the discretion of the instructor.
All course material will be posted to OWL: [http://owl.uwo.ca](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 [OWL Help page](http://owl.uwo.ca). Alternatively, they can contact the [Western Technology Services Helpdesk](http://owl.uwo.ca). They can be contacted by phone at 519-661-3800 or ext. 83800.

[Google Chrome](http://owl.uwo.ca) or [Mozilla Firefox](http://owl.uwo.ca) are the preferred browsers to optimally use OWL; update you’re your browsers frequently. Students interested in evaluating their internet speed, please click here.

**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 enrol 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.

5. **Course Objectives and Learning Outcomes:**

**Course Objectives:**

The main objective of this course is to introduce students to the basic molecular, physiological and morphological events that regulate pluripotent stem cell biology. Additional objectives are: to improve the students’ ability to read and understand primary scientific literature, to write about science effectively to a lay audience and to provide students with an opportunity to conceptually translate their knowledge of stem cell biology to solve biological problems by designing novel experiments and stem cell based therapies. The course material will include didactic lecturing, but will also utilized a flipped classroom approach for students to conduct in-class exercises to properly examine primary research journal papers, to learn how to write scientific and lay articles and how to properly design hypothesis driven experiments. Students will be expected to come prepared to discuss the content of assigned research articles in class as well as work independently outside the lectures. The lectures will focus mainly on the factors and signalling pathways that govern development of the early embryo, embryo-derived stem cells concentrating on the physiology, utility and ethical issues that surround pluripotent stem cell technologies.
A student who has met the objectives of the course will be able to:

- Explain the basic concepts of stem cell self-renewal and pluripotency and how these features are evaluated in the stem cell field
- Apply their understanding of the basic concepts and fundamental mechanisms that regulate pluripotent stem cells as it relates to developmental biology to solve problems/questions
- Navigate, understand and critically evaluate published stem cell research literature
- Debate current ethical issues that surround pluripotent stem cell biotechnologies
- Effectively communicate scientific knowledge about pluripotent stem cells to the lay public

**Method of Presentation:** The material of the course will be presented in the form of in-person and recorded didactic lectures and a partial flipped classroom platform that includes problem based learning exercises and informal in-class discussions, exercises and debates.

**Methods of Evaluation (Students will be expected to):**

- Actively participate in regular classroom discussions and debates
- Read assigned scientific papers *prior* to class
- Utilize current scientific literature in preparing assignments
- Prepare a scientific lay article
- Apply their learned basic science knowledge of the stem cell field to propose experiments to solve scientific problems/questions
- Write, in short answer essay format, on quizzes, the mid-term and final examinations
Course Learning Outcomes:

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

- Demonstrate a detailed knowledge and critical understanding of key concepts and regulatory mechanisms governing pluripotent stem cell function by describing concepts, applying and integrating ones’ knowledge, and critically evaluating and reflecting upon major theories, practices and ethical issues in the field.

- Demonstrate a strong understanding of the scientific methodologies behind pluripotent stem cells by formulating hypotheses, designing experiments, analyzing and interpreting data and making reasoned conclusions and improvements in experimental design in light of published work.

- Interpret figures and proper figure descriptions along with identifying the strengths and weaknesses of information and the various research techniques used.

- Perform literature searches and be able to evaluate and critique current literature in pluripotent stem cell physiology to generate a clear and concise written layperson article.

- Explain and apply different stem cell models and technologies (e.g. knockout vs. knock-in, genome editing approaches etc.) with varying experimental procedures (Western vs. real time RT-qPCR etc.) to interpret the scientific literature encompassing the pluripotent stem cell field.

- Demonstrate the ability to critically evaluate, manage, reflect on, integrate and apply their pluripotent stem cell knowledge in solving problem based learning exercises and examination questions.

- Develop convincing arguments to effectively debate complex ideas and relevant scientific and/or ethical issues to be made aware of that scientific knowledge changes, has different interpretations and that ethical issues are not always simple choices between two differing views.
6. Course Content and Schedule:

- In-person components: Thursdays, 2:30 - 4:20 Western Active Learning Space (WALS, Room 66, UCC)
- Asynchronous course material (recorded lectures, readings) will be available through OWL
- Remote synchronous course activities (if necessary) will be Thursdays, 2:30 - 4:20 via Zoom (online link will be provided)

<table>
<thead>
<tr>
<th>#</th>
<th>DATE</th>
<th>TOPIC (Instructor)</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sept. 9</td>
<td>History of pluripotent stem cells; fundamental principles of pluripotent stem cells; In-person “Stem Cell Cartoon” assignment</td>
<td>Betts</td>
</tr>
<tr>
<td>2</td>
<td>Sept. 16</td>
<td>Cell Differentiation/Lineage Restriction</td>
<td>Séguin</td>
</tr>
<tr>
<td>3</td>
<td>Sept. 23</td>
<td>Embryonic Stem Cells and Pluripotency</td>
<td>Séguin</td>
</tr>
<tr>
<td>4</td>
<td>Sept. 30</td>
<td>Extracellular Signals to Direct Stem Cell Differentiation</td>
<td>Séguin</td>
</tr>
<tr>
<td>5</td>
<td>Oct. 7</td>
<td>Intracellular Signals to Direct Stem Cell Differentiation</td>
<td>Séguin</td>
</tr>
<tr>
<td>6</td>
<td>Oct. 14</td>
<td>Somatic Cell Cloning and Epigenetic Reprogramming in Mammals</td>
<td>Betts</td>
</tr>
<tr>
<td>7</td>
<td>Oct. 21</td>
<td>Induced Pluripotent Stem Cells; in-person paper discussion</td>
<td>Betts</td>
</tr>
<tr>
<td>8</td>
<td>Oct. 28</td>
<td>In class Midterm Test (questions based on first 7 topics) Asynchronous recorded lecture: ““Omic approaches and genetic manipulation of pluripotent stem cells”</td>
<td>Betts and Séguin</td>
</tr>
<tr>
<td>9</td>
<td>Nov. 4</td>
<td>No Class, Fall Reading Week</td>
<td>N/A</td>
</tr>
<tr>
<td>10</td>
<td>Nov. 11</td>
<td>Asynchronous recorded lecture: “Ethical Issues Surrounding Pluripotent Stem Cells” In class activity to play “decide” ethics kit on pluripotent stem cell issue</td>
<td>Betts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Betts and Séguin</td>
</tr>
<tr>
<td>11</td>
<td>Nov. 18</td>
<td>In class “jigsaw” presentations with class discussions</td>
<td>Betts and Séguin</td>
</tr>
<tr>
<td>12</td>
<td>Nov. 25</td>
<td>Cell-Based Therapies from Pluripotent Stem Cells; in-person meetings with each group to discuss initial ideas</td>
<td>Betts</td>
</tr>
<tr>
<td>13</td>
<td>Dec. 2</td>
<td>Design your own pluripotent stem cell based therapy - in person session with entire class to view and discuss group therapies</td>
<td>Betts</td>
</tr>
</tbody>
</table>

* Journal papers, recorded lectures and exercises for these weekly topics will be made available on the course OWL site at least the week prior to each in-person/virtual session.

7. Participation and Engagement:

☒ Students are expected to participate and engage with content as much as possible.

☒ Students can participate during sessions or post on OWL after watching recorded sessions/lectures if attendance in-person is not possible.

☒ Students can also participate by interaction in the forums with their peers and instructors.
8. Evaluation:

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

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Format</th>
<th>Weighting</th>
<th>Due Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem Cell Cartoon</td>
<td>Digital cartoon with caption</td>
<td>5%</td>
<td>Sept. 24, 2021</td>
</tr>
<tr>
<td>Layperson Article</td>
<td>Written assignment</td>
<td>10%</td>
<td>Oct. 22, 2021</td>
</tr>
<tr>
<td>Mid-term test</td>
<td>In-person, short and long answer</td>
<td>35%</td>
<td>Oct. 28, 2021</td>
</tr>
<tr>
<td>Jigsaw Presentations</td>
<td>In-person</td>
<td>10%</td>
<td>Nov. 18, 2021</td>
</tr>
<tr>
<td>Final Exam</td>
<td>In-person, short and long answer</td>
<td>40%</td>
<td>Dec. 10 - 21, 2021</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td></td>
<td><strong>100%</strong></td>
<td></td>
</tr>
</tbody>
</table>

The in-person mid-term test (2 hrs) and final exam (3 hrs) will consist of short answer essay type questions developed from lectures, assigned readings/exercises and other presented material. The final exam will be cumulative, with emphasis on the second half of the course.

☒ All assignments are due at 11:55 pm EST unless otherwise specified
☒ Written assignments 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
☒ After an assessment is returned, students should wait 24 hrs 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.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+</td>
<td>90 - 100</td>
<td>One could scarcely expect better from a student at this level</td>
</tr>
<tr>
<td>A</td>
<td>80 - 89</td>
<td>Superior work which is clearly above average</td>
</tr>
<tr>
<td>B</td>
<td>70 - 79</td>
<td>Good work, meeting all requirements, and eminently satisfactory</td>
</tr>
<tr>
<td>C</td>
<td>60 - 69</td>
<td>Competent work, meeting requirements</td>
</tr>
<tr>
<td>D</td>
<td>50 - 59</td>
<td>Fair work, minimally acceptable</td>
</tr>
<tr>
<td>F</td>
<td>below 50</td>
<td>Fail</td>
</tr>
</tbody>
</table>
**Information about late or missed evaluations:**

☒ Late assessments **without** documentation or a self-reported absence will be subject to a late penalty of 5% **per day**

☒ Late assessments **with** a self-reported absence should be submitted within 24 hours of submission of the last day of the self-report or accommodation (e.g., due Fri 11:55 pm; self-report covers Fri/Sat; new deadline is Sun by 11:55 pm OR 24 hours after the end of the accommodation period)

☒ An assessment cannot be submitted after it has been returned to the class; an alternate assessment will be assigned

☒ A **single** make-up test/exam will be offered

☒ All course components must be completed to pass the course

☒ If a make-up assessment is missed, the student will receive an INC and complete the task the next time the course is offered

**Policy on the Rounding and Bumping of Marks:**

Across the Basic Medical Sciences Undergraduate Education programs and within the department of **Physiology and Pharmacology** 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.

**9. Communication:**

☒ Students should check the OWL site every 24 - 48 hours

☒ A weekly update will be provided on the OWL announcements

☒ Students should email their instructor(s) and teaching assistant(s) using OWL “messages”

☒ Emails will be monitored daily; students will receive a response in 24 – 48 hours

☒ This course will use an online platform such as Zoom for synchronous course activities and student meetings
11. Resources:

☒ 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 or teaching assistants

10. Office Hours:

☒ Office hours with individuals or groups will be held in-person or remotely using Zoom
☒ Students will be able to sign up for an appointment using OWL

11. Resources:

☒ All resources will be posted in OWL
☒ No required textbook
☒ No required study guide
☒ Additional resources:


Supplemental Information: Published journal articles will be provided for downloading from OWL as required reading for lectures. Students are encouraged to peruse the scientific literature and read review and/or primary research articles in the stem cell biology field. Examples of such journals: Cell Stem Cells, Cellular Reprogramming, Current Stem Cell Research, Development, Journal of Cell Science, Journal of Biological Chemistry, Nature journals, Proc Natl Acad Sci U S A, Science, Stem Cells, Stem Cell Reports, Stem Cells and Development.
12. Professionalism and 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
☒ Any recorded virtual 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. Make it a daily habit to log onto OWL to ensure you have seen everything posted to help you succeed in this class.

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. 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).

6. Connect with others. Try forming an online study group and try meeting on a weekly basis for study and peer support.

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. Science and BMSc students can contact academic counselling through the Help Portal: https://www.uwo.ca/sci/counselling/.

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.

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 here.

Essay Course Guidelines

The guidelines for the minimum written assignments refer to the cumulative amount of written work in a course but excludes written work in examinations. You can read about essay course guidelines here.

An essay course must normally involve total written assignments (essays or other appropriate prose composition, excluding examinations) as follows:

- Full course (1000 to 1999): at least 3000 words
- Half course (1000 to 1999): at least 1500 words
- Full course (2000 and above): at least 5000 words
- Half course (2000 and above): at least 2500 words

The structure of the essay course must be such that in order to pass the course, the student must exhibit some minimal level of competence in essay writing and the appropriate level of knowledge of the content of the course.

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.

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

Health and Mental Wellbeing