



UNIVERSITY OF  
CALGARY

DEPARTMENT OF BIOLOGICAL SCIENCES  
COURSE OUTLINE  
WINTER 2020

<b>COURSE TITLE: Introduction to Cellular &amp; Molecular Biology</b>			
<b>Course Number (*)</b>	BIOL 331		
<b>Pre/Co-Requisites (*)</b>	BIOL 311 See section 3.5.C in the Faculty of Science section of the online Calendar.		
<b>Faculty / Department</b>	Faculty of Science Department of Biological Sciences BI 186 403-220-3140 biosci@ucalgary.ca		
<b>Lecture section</b>	MWF	12:00-12:50 PM	ST 140
<b>Tutorial sections</b>	All scheduled laboratories will begin the week of January 27, 2019.		
	T01, T02, T03	Mondays at 13:00 PM	ST 057, ST 055, SS 209
	T04, T05, T06	Mondays at 14:00 PM	SS 209, ST 055, ST 057
	T07, T08	Mondays at 16:00 PM	ST 059, ST 055
	T10, T11	Mondays at 17:00 PM	ST 057, ST 055
	T13, T14	Tuesdays at 9:00 AM	ST 057, ST 055
	T15, T16	Wednesdays at 9:00 AM	SS 209, ST 057
	T17	Thursdays at 9:00 AM	SS 209

***Welcome to BIOL 331!***

We are looking forward to studying cell and molecular biology with you this semester.

Your BIOL 331 Teaching Team

<b>BIOL 331 Teaching Team</b>				
<b>Course coordinator</b>	Dr. Isabelle Barrette-Ng			
<b>Instructors</b>	Dr. Isabelle Barrette-Ng	mibarret@ucalgary.ca	BI 430A	403-220-4320
	Dr. John Cobb	jacobb@ucalgary.ca	BI 286D	403-220-3554
	Dr. Doug Muench	dmuench@ucalgary.ca	BI 399	403-220-7935
<b>Instructors' office hours and office locations</b>	Please refer to D2L site for details.			
<b>TA's</b>	Please refer to our D2L site for the complete list of all TA's, their contact information and their office hours.			
<b>Important note for email correspondence</b>	Please use your U of C account for all course correspondence with any member of the BIOL 331 teaching team.			
	Please use the course email ( <a href="mailto:biol331@ucalgary.ca">biol331@ucalgary.ca</a> ) for correspondence, except in genuine emergencies.			

<b>OVERVIEW OF THE COURSE</b>
<p>In this course, we will work together to study the following topics: cellular structure and function; molecular organization of membranes, organelles, nucleus and cytoplasmic structures; the integration of cellular functions; assembly of organelles; the regulation of cell proliferation; and the interaction of cells with their neighbours and their environment. Our work together in both the lecture and tutorial components of the course will focus on applying our knowledge and solving problems. You will have many opportunities to practice applying your learning and obtain feedback. To succeed in cell and molecular biology, you need to practice, practice and practice! As such, you will be invited to engage in interactive class and tutorial problem-solving sessions, critical reading, group work, and online discussions.</p> <p>The course is broken down into the following 10 themes, with each theme containing a series of topics and sub-topics:</p> <ol style="list-style-type: none"> <li>1. Cells are functional units of life.</li> <li>2. Cellular membranes are critical to biological processes in the cell.</li> <li>3. Protein synthesis and the endomembrane system.</li> <li>4. Different types of vesicles allow for anterograde and retrograde transport.</li> <li>5. The cytoskeleton of a cell is important for vesicular transport.</li> <li>6. Plant cell biology</li> <li>7. Interactions between cells and the environment</li> <li>8. Cell communication</li> <li>9. Control of gene expression and reprogramming</li> <li>10. Cancer and what protects us</li> </ol>

## LEARNING RESOURCES

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

### Required Textbooks (available at the UCalgary Bookstore):

Iwasa, J., & Marshall, W. (2016). *Karp's Cell and Molecular Biology: Concepts and Experiments* (8<sup>th</sup> Edition). Hoboken, NJ: Wiley.

Please note that older editions of the textbook are quite different from the 8<sup>th</sup> edition.

One copy of the 8<sup>th</sup> edition of the textbook will be available from the Reserve Collection at the TFDL.

### Technology Requirements:

**(a) D2L:** A shell in D2L (BIOL 331 L01 – (Winter 2020) – Introduction to Cellular and Molecular Biology) is set up for this course where lecture and tutorial materials, as well as all assignments, will be posted. A laptop, desktop, or mobile device is required for D2L access.

**(b) Top Hat:** In the lecture component of this course, we will use the Top Hat classroom performance system, where you will be asked to use a cell phone to text answers to questions during class. The use of the Top Hat system is optional, but highly recommended to enhance learning in the classroom.

If you wish to participate, you need to have a cell phone with which you can send text messages, and you need to register for an account with Top Hat. Account registration is free. Further details on how to register for an account are available from D2L.

If you are unable to use the Top Hat system, please contact Dr. Barrette-Ng by January 17, 2020, to make alternate arrangements.

## COURSE LEARNING OUTCOMES

At the end of this course, you will be able to:

1. explain how macromolecules interact to support cell structure, function, dynamics and responses to environmental signals;
2. describe the evolutionary diversity of cells, and how this diversity contributes to tissue and whole organism function; and
3. apply knowledge and technical understanding of cell and molecular biology to interpret experimental data.

## METHOD OF INSTRUCTION

To enhance your learning experience in BIOL 331 and help you hone your problem-solving skills, we will be using a flipped learning approach in the first half of this semester. Various studies performed at post-secondary institutions across North America including our own have shown that this approach helps you learn material at a deeper level and achieve greater academic success.

In using this approach, I will do some lecturing, but we will focus much of our class time on working together in teams to solve problems. To facilitate the work we will do in teams together this semester, we will make use of the ITP Metrics system. This free, secure, web-based tool will be used to form teams in the first week of the semester and to conduct peer evaluations of team work throughout the semester.

The BIOL 331 teaching team is excited to use the flipped learning approach this semester so that we can work with you during class and help you to apply your knowledge to various problems. In order for you to best make use of the time we spend in class working on problems, you will be asked at times to listen to short, 5-10 minute podcasts available through D2L or to read certain sections of the textbook before coming to class. More information on this approach as well as reading/podcast lists will be provided in class and on D2L.

### ASSESSMENT COMPONENTS

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

Component	Description/dates	Weight	Aligned Course Learning Outcome
In-class team application activities	Some of the practice problems we will work on together during class time will be graded. There will be six in-class assignments during the semester that will be collected at the end of the lecture and graded. Each in-class team application activity is LOW STAKES and will be worth at most between 1-1.5%. The goal of the graded in-class team application activities is to give us an opportunity to provide you with frequent feedback to help you master the concepts we will study. The dates on which graded in-class assignments will be held are listed in the lecture and tutorial schedule at the end of this document.	7%	1, 2, 3
In-class and online quizzes	There will be five in-class or online quizzes; the dates on which each quiz will be administered are listed in the lecture and tutorial schedule at the end of this document. Each LOW-STAKES quiz has been designed to help you assess your understanding of the various concepts we will be studying together this semester and to help you prepare for the exams. Further details on these quizzes will be given during the lecture component of this course.	6%	1, 2, 3
Midterm exam	The midterm exam will be held on <b>Saturday March 7, 2020 from 5-7 PM</b> . It will consist of multiple-choice questions focused on the content covered in the first half of the semester. Room locations will be posted on D2L. Regularly scheduled classes have precedence over any out-of-class-time activity. If you have a clash with this out-of-class-time activity, please contact Dr. Barrette-Ng by January 31, 2020 so that alternative arrangements may be made for you.	28%	1, 2, 3

Lecture assignment	Although this assignment will focus on the topics covered in the second half of the semester, it builds on the material covered in the first half. It will be assigned in late March, and further details will be available on D2L.	6%	1, 2, 3
Final exam	The final exam will consist of multiple-choice questions and will be two hours in length. The content to be examined will be drawn from the topics covered in the second half of the course. Please note, however, that this content builds on the first half of the course. It will be scheduled by the Registrar's Office between April 18-29, inclusive. Once scheduled, the date, time and location will be posted on D2L.	34%	1, 2, 3
Tutorials	Various tutorial components have predetermined weighting to a total of 30% as specified in the Lab Manual available on D2L. Please see pages 4-6 of the document called "Introduction to the labs" for a complete list of due dates for each lab component. You can find this document in the Labs folder on D2L.	17%	1, 2, 3
Team contract and peer assessment	You will be asked to work with your teammates to draft a team contract in class on January 15. This is worth 1% of your final grade.  At the end of the term, you will be asked to complete a peer assessment of your teammates. This is worth 1% of your final grade. Further details on this peer assessment will be available on D2L.	2%	N/A

#### ASSESSMENT AND EVALUATION INFORMATION

##### CALCULATION OF YOUR FINAL GRADE AND CONVERSION TO LETTER GRADE:

Each piece of work (reports, assignments, quizzes, midterm exam or final examination) you submit will be assigned a grade. Your 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:

Letter Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+	D
Min. Percent Required	91	86	81	76	71	67	63	59	55	50	45

**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 your responsibility to familiarize yourself with these regulations. See also Section E.3 of the University Calendar.

If you miss a tutorial, in-class assignment, or the midterm exam, please submit supporting documentation (e.g., doctor's note or oath from the Commissioner of Oaths on campus) to Dr. Barrette-Ng's office within 48 hours of the date of your absence.

If you miss the final exam, please contact the Registrar's Office. Please see <https://www.ucalgary.ca/registrar/exams/deferred-exams> for reasons that will be accepted by the Registrar's Office to defer a final exam as well as the procedure to apply for a deferred exam.

**SCHEDULED OUT-OF-CLASS ACTIVITIES:**

Other than the midterm exam, there are no scheduled out-of-class activities for this course.

**MID TERM EXAM: SATURDAY, MARCH 7/20 5-7pm ROOM: TBA**

**REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY.** If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

**EXAMINATION POLICY:**

You may use only a non-programmable calculator during examinations.

Please read the Calendar, Section G, on Examinations.

**WRITING ACROSS THE CURRICULUM:**

For all components of the course, in any written work, the quality of your 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.

**LATE ASSIGNMENTS:**

Please refer to D2L for information on submitting late assignments.

**REAPPRAISAL OF GRADES:**

Please see Section I.3 of the University Calendar.

For lecture in-class assignments and the midterm exam, please present in writing your rationale for requesting a grade reappraisal as effectively and as fully as possible to the Course coordinator/instructor within 10 business days of either being notified about the mark, or of the item's return to the class. If you are not satisfied with the outcome, you can submit the Reappraisal of Graded Term work form to the Department of Biological Sciences within 2 business days of receiving the decision from the instructor. The department will arrange for a re-assessment of your work if, and only if, you have sufficient academic grounds. See sections I.1 and I.2 of the University Calendar.

For tutorial assignments, please use the form entitled "Request for re-evaluation of term work for BIOL 331" (available from D2L) to prepare a written summary of your concerns related to the grading of your work. Please submit the completed to your G.T.A. within 10 business days of the date when the grade work was originally handed back. If you still have concerns about the grading of your work following the re-evaluation by your G.T.A., you may submit the form completed by you and your G.T.A. along with your original graded assignment to Dr. Barrette-Ng.

For the final exam, please submit the request to Enrolment Services. See Section I.3 of the University Calendar.

**HUMAN & LIVING ORGANISM STUDIES:**

You will not be asked to 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 the 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 concerns 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.

**INTERNET AND ELECTRONIC COMMUNICATION DEVICE INFORMATION**

The use of laptop and mobile devices is acceptable when used in a manner appropriate to the course and classroom activities. Students are to refrain from accessing websites that may be distracting for fellow learners (e.g. personal emails, Facebook, YouTube).

Students are responsible for being aware of the University's Internet and email use policy, which can be found at <https://www.ucalgary.ca/policies/files/policies/electronic-communications-policy.pdf>

## UNIVERSITY OF CALGARY POLICIES AND SUPPORTS

### ACADEMIC ACCOMMODATION

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.

### 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.**

### INSTRUCTOR INTELLECTUAL PROPERTY

Course materials created by professor(s) (including course outlines, presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the professor(s). These materials may NOT be reproduced, redistributed or copied without the explicit consent of the professor. The posting of course materials to third party websites such as note-sharing sites without permission is prohibited. Sharing of extracts of these course materials with other students enrolled in the course at the same time may be allowed under fair dealing.

### COPYRIGHT OF COURSE MATERIALS

All course materials (including those posted on the course D2L site, a course website, or used in any teaching activity such as (but not limited to) examinations, quizzes, assignments, laboratory manuals, lecture slides or lecture materials and other course notes) are protected by law. These materials are for the sole use of students registered in this course and must not be redistributed. Sharing these materials with anyone else would be a breach of the terms and conditions governing student access to D2L, as well as a violation of the copyright in these materials, and may be pursued as a case of student academic or [non-academic misconduct](#), in addition to any other remedies available at law. All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright ([www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf](http://www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf)) and requirements of the copyright act (<https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html>) to ensure they are aware of the consequences of unauthorised sharing of course materials (including instructor notes, electronic versions of textbooks etc.).



## **FREEDOM OF INFORMATION AND PROTECTION OF 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.

## **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](#)).

## **SU WELLNESS CENTRE:**

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.

## **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.

## **SUPPORTS FOR STUDENT LEARNING, SUCCESS, AND SAFETY**

**Student Union Information:** VP Academic, Phone: 403-220-3911 Email: [suwpaca@ucalgary.ca](mailto:suwpaca@ucalgary.ca). SU Faculty Rep., Phone: 403-220-3913 Email: [sciencerep@su.ucalgary.ca](mailto:sciencerep@su.ucalgary.ca). Student Ombudsman, Email: [ombuds@ucalgary.ca](mailto:ombuds@ucalgary.ca)

**Student Success Centre:** The Student Success Centre provides services and programs to ensure students can make the most of their time at the University of Calgary. Our advisors, learning support staff, and writing support staff assist students in enhancing their skills and achieving their academic goals. They provide tailored learning support and advising programs, as well as one-on-one services, free of charge to all undergraduate and graduate students. For more information visit: <https://www.ucalgary.ca/student-services/student-success>

**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 .

**ASSEMBLY POINTS**

As part of the University of Calgary Emergency Evacuation plan, students, faculty, and staff should locate the closest Assembly Point in case of Fire Alarm. Safety signage is posted throughout the campus showing the locations and the possible route to these locations. All students, faculty, and staff are expected to promptly make their way to the nearest Assembly Point if the Fire Alarm is activated. No one is to return into campus facilities until an all clear is given to the warden in charge of the Assembly Area.

**SAFEWALK**

Campus Security will escort individuals day or night (See the Campus Safewalk website). Call 403-220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.

## Tentative BIOL 331 Lecture and Tutorial Schedule Winter 2020

Module	Topic	Readings	Lecturer(s)	Date	Class	Tutorial	
Orientation to the course		N/A	Dr. Barrette-Ng	January	13	Why is studying cell and molecular biology important? How can you succeed in this course?	No tutorial during week of January 13, 2020.
					15	Getting into teams and drafting team contracts (worth 1%)	
1: Cells as functional units of life		Ch. 1	Dr. Barrette-Ng		17	Practice RAT on basic functions of cells (worth 1%; pass/fail only)	
2: Cellular membranes are critical to biological processes in the cell.	Introduction to cellular membranes	4.1-4.4, 4.6	Dr. Barrette-Ng	January	20	iRAT and tRAT quiz #1 – Membrane composition (worth 1%)	No tutorial during week of January 20, 2020.
					22	Membrane composition, asymmetry, and fluidity	
					24	Team application activity #1 – Membrane physicochemical properties (worth 1%)	
	Membrane transport	4.9-4.14	Dr. Barrette-Ng	January	27	iRAT and tRAT quiz #2 – Membrane proteins (worth 1.5%)	Tutorial #1 during week of January 27, 2020. Topics: Reviewing team contracts and foundational molecular biology knowledge (worth 1%)
					29	Applying our knowledge: deeper examination of peripheral and lipid-anchored membrane proteins	
					31	Team application activity #2 – membrane transport (worth 1.5%)	
	Membrane potentials and action potentials	4.16-4.17	Dr. Barrette-Ng	February	3	iRAT and tRAT quiz #3 – Active membrane transport (worth 1.5%)	Tutorial #2 during week of February 3, 2020. Topics: Isolating and studying membrane protein mobility (worth 2%)
5					Action potentials		
Endomembrane system	portions of 8.1, 8.3, 8.8, 8.9, 8.10, 8.13, 8.14, and 8.19	Dr. Barrette-Ng	February	7	Introduction to the endomembrane system (completion of reading and online quiz prior to coming to class is required; worth 1%) Team application activity #3 – applying our knowledge on the endomembrane system (worth 1%)		
3: Protein synthesis and the endomembrane system	portions of 8.4, 8.6, and 8.7	Dr. Barrette-Ng	February	10	Protein synthesis, glycosylation, transport and quality control	Tutorial #3 during week of February 10, 2020.	
4: Different types of vesicles allow for anterograde and retrograde transport.	portions of 8.9, 8.10, and 8.11	Dr. Barrette-Ng	February	12	Traffic between the RER and Golgi	Topics: Membrane potentials and ion channels (worth 2%)	
				14	Traffic beyond the Golgi Team application activity #4 – applying our knowledge on cellular traffic (worth 1%)		
5: The cytoskeleton of a cell is important for vesicular transport.	portions of 9.1, 9.2, 9.3, 9.5, 9.6, 9.10, and 9.11	Dr. Barrette-Ng	February	24	Vesicular transport and the cytoskeleton (completion of reading and online quiz prior to coming to class is required; worth 1%)	Tutorial #4 during week of February 24, 2020. Topics: Subcellular fractionation, differential centrifugation, and fluorescence microscopy (worth 2%)	
				26	Team application activity #5 – synthesizing our knowledge (worth 1.5%)		
6: Plant cell biology	Part 1: pages 323-325; section 9.6 Part 2: pages 142, 254, 255, 570, 571; sections 4.10, 7.14, 14.11 Part 3: pages 250-251, 292, 293; sections 7.12, 8.16	Dr. Muench	March	28	Plant cell biology I	Tutorial #5 during week of March 2, 2020. Topics: Endocytosis, exocytosis and vesicular transport (worth 2%)	
				2	Plant cell biology II		
				4	Plant cell biology III		
7: Interactions between cells and environment	12.3, 12.4, 12.7, 12.9, 1.6, 7.0-7.8, 7.10-7.12 (not plasmodesmata)	Dr. Cobb	March	6	DNA organization and chromosome structure, epigenetics	Tutorial #6 during week of March 9, 2020. Topics: Electron microscopy and antibody labelling (worth 2%)	
				9	Stem cells, therapeutic and reproductive cloning		
				11	Cell-cell interactions		
				13	Cell-junctions I & II		
8: Cell communication	15.1-15.3, 15.6, 15.7, 15.10, 15.11, 15.15	Dr. Cobb	March	16	Extracellular matrix	Tutorial #7 during week of March 16, 2020. Topics: Gap junctions and tight junctions (worth 2%)	
				18	Introduction to intercellular signaling		
				20	Cell signaling: G proteins & cAMP pathway		
				23	Cell signaling: IP3/Ca <sup>2+</sup> /PKC pathways		
9: Control of gene expression and reprogramming	12.14, 12.15, 12.17, 14.1, 14.2, 14.4	Dr. Cobb	March	25	Cell signaling: Receptor tyrosine kinases	Tutorial #8 during week of March 23, 2020. Topics: Matrix metalloproteases, scratch migration assays, Boyden chamber assays, and zymography (worth 2%)	
				27	Gene regulation and steroid hormones		
				30	Regulation of the cell cycle: I		
10: Cancer and what protects us		Dr. Cobb	April	1	Regulation of the cell cycle: II	Tutorial #9 during week of March 30, 2020. Topics: Gene expression profiling and cell-based assays (worth 2%)	
				3	DNA damage and cell cycle checkpoints		

	14.5, 15.17, 16.1, 16.2, 16.4-16.9			6	Apoptosis	No tutorial during week of April 6, 2020.
				8	Cell biology of cancer: introduction	
				15	Tumor suppressors, proto-oncogenes and oncogenes	No tutorial during week of April 13, 2020.

**Important notes:**

- The lecture midterm will be held on Saturday March 7, 2020 from 5-7 PM.
- Winter Break is from February 17-21, 2020. No classes or tutorials will be held during this time.
- There are no classes or tutorials on Friday April 10 or Monday April 13 due to the Easter holiday.

Department Approval \_\_\_\_\_ ORIGINAL SIGNED \_\_\_\_\_ Date \_\_\_\_\_

Associate Dean Approval

For Out Of Class Activity: \_\_\_\_\_ ORIGINAL SIGNED \_\_\_\_\_ Date: \_\_\_\_\_

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