BIOL 465 (CRN 10423 - A01)
The Molecular Biology of Cancer
Fall 2025
Tues/Wed/Fri 4:30 pm - 5:20 pm
Location: Human & Social Development HSD: A240

Lecture: Cornett Building A240; Tues/Wed/Fri 4:30 pm - 5:20 pm
Lectures will be in class but available on Echo360 after class for 1 week.

Office Hrs.: Cunningham 217 *or* on Zoom. Tues. 3:15 - 4:15 pm, or at another arranged time (please email before with BIOL 465 as the subject).

Instructors: Dr. Patrick Walter **Email: pwalter@uvic.ca**
Dr. Julian Lum **Email: JLum@bccancer.bc.ca**

Intended Learning Outcomes:
This is an introduction and molecular course of fundamental cancer biology topics, such as key known cancer hallmarks. Following this course, you should be able to describe key aspects of several oncogene signal transduction pathways, tumor suppressor proteins, different types of cell death and immune system pathways (including growth pathways, cancer metabolism, hormone driven cancers, and the role of certain environmental conditions). You should be able to demonstrate a grasp of the molecular consequences of sporadic and/or germ line mutations and how they cause disruption/deregulation to key pathways and describe the pathologies behind some more common cancers.
You should also have a working understanding of:
- Oncogene signaling pathways, tumor suppressor pathways and key aspects of the immune system.
- Cancer cell metabolism, and the cells involved in the tumor microenvironment.
- The molecular bases for particular hormones in driving some cancers.
- How stem cells and chemo-resistance contribute to the poor prognosis of certain cancers.
In addition, you should be able to critically interpret scientific literature related to cancer biology.

Description:
This course will cover molecular events that lead to cancer. The course will be divided into sections structured around first understanding important signal transduction pathways in cancer and then discussing some of the major types of cancer, including leukemia, breast, and CLL. Special emphasis will be placed on understanding the signal transduction pathways important in driving tumorigenesis in each of the sites, in particular the role of tumor suppressors and oncogenes. The course will consist of formal lectures and assigned journal article reading from the current literature, discussions and class questions using BightSpace. The goal of the journal article reading, discussions and questions will be to create an interactive environment to introduce students to the role of scientific discovery in the development of ideas in understanding cancer mechanisms and treatments. The use of genetic tools such as transgenic and knockout mouse models to dissect oncogenic pathways will be examined, and experimental design will be discussed. You are expected to have familiarity with cell biology and cell signaling – i.e., have taken biology 360, OR either of Bioc 300a or Bioc 300b. If you wish to review molecular cancer details, there is an excellent textbook by Dr. Robert A. Weinberg, “The Biology of Cancer” by Garland Science (ISBN 9780815342205) that is recommended. This is **NOT** a required text but is a useful reference if you feel you have a deficiency in background material or if you simply learn better from textbooks.

Description from the UVic Calendar:

Units: 1.5, Hours: 3-0
Clinical terminology, concepts of cancer epidemiology, DNA mutation and repair, molecular basis of cell cycle regulation, cell proliferation and apoptosis. Special emphasis on chemotherapy, gene therapy, diet and cancer, and the immunology of cancer

Prerequisites: BIOL 225, 230, AND 1 of the following: BIOL 360 OR either of BIOC 300a or 300b

Office Hours (please send an email with Biol465 in the subject):
Online or in Cunn 217 4:15 – 5:15 Tuesdays and Fridays (by appointment). The instructor that teaches the lecture that follows will be present. Dr. Walter is adjunct faculty and therefore has limited time on campus, and Dr. Lum is not on campus except for this course. If these times conflict with your schedule, e-mail to set up an alternate time.

Brightspace:
This course uses the university Brightspace learning/teaching resource. To access this Course, use your Netlink ID and password and log onto Brightspace from https://www.uvic.ca/ OR directly: https://bright.uvic.ca/d2l/home/420310
We will post the course notes outline, journal article guidelines and other important information through this site. We will also post the PowerPoint presentation (in pdf format) for each lecture prior to each class. You may choose to print the slides and add notes to them during class. Please check Brightspace regularly, as this is where course announcements will be posted.

We will also use BrightSpace for in-class questions and assigned homework questions. This will be worth 15%. Review questions, discussions of scientific papers, and in-class questions will be posted. 5% bonus grade for answering 70% of the in-class questions.

Optional Course Text:
The Biology of Cancer by Robert A. Weinberg. ***This text is recommended / optional, and not required.*** This text is now available in a digital format and is a great text with extensive clinical information. If you intend to continue studying in the medical field, it would be a good reference text for you to own. We will NOT be covering all the material in the text. The primary source of information will be the lecture slides covered online in class. Copies of the textbook are in the library. There also may be secondhand copies of the text, which *may* be available from the Used Book Store.

Assigned Material and Journal Articles:
Because there is not an assigned text for the course, topics will be drawn from primary and review articles from the scientific literature which will be assigned during class and links posted on Brightspace. Lecture time will be allocated to going over the papers as part of class discussion. Reading assignments are mandatory and will be included in the evaluation (i.e. on the midterm and final exams). In addition, when readings are assigned for a discussion lecture, students must come to the lecture prepared to discuss the paper and having read the assigned reading. Students are also expected to attend the lectures, to take notes and to participate in discussions. Questions will be asked during class using BightSpace throughout the term. Questions on each journal article will be tested on the midterm and final exam. See below for details regarding the journal articles, these Journal article discussion questions will be posted on BightSpace.

Course Evaluation:

32% Midterm (Required) – Tuesday Oct. 21 (50 min in class (Face to Face), but on BightSpace. Cumulative, includes journal articles and will be short answer or multiple choice). If the midterm is missed with a medical excuse, there will be a makeup exam at a scheduled date. If you feel that we should be made aware of any special circumstances or accommodation for your participation in the course, please notify us (see below).
The midterm exam must be written to receive a final grade for the course.
38% Final exam (Required) - Date TBD, (on campus, Face to Face), Saturday Dec. 7th or thereafter (3 hours, cumulative but builds on the previous section's material)
Must be completed to receive a final grade for the course. Deferred exams will be handled as outlined in the University of Victoria calendar.
The midterm exam must be written to receive a final grade for the course.
20% In Class and Homework Assigned Review Questions on BightSpace
We will also use BrightSpace for in-class questions and assigned homework questions. This will be worth 20%. Review questions, discussions of scientific papers, and in-class questions will be posted. For participation in these questions students will be given 5% for answering ≥ 70% of these questions.
10% - Journal article take-home assignments
Journal articles will be assigned, and some class time will be spent discussing them. We will assess your comprehension and critical interpretation of the journal articles and their data through 2 (5% each) take-home assignments containing multiple choice, fill in the blank, and/or short answer questions (Brightspace).

Please monitor the due dates for in-class questions and take-home assignments, Brightspace will cut off submissions at that time, resulting in zero, for late submissions.

Students are expected to be present for the midterm and final exam on the specified dates. Failure to write the midterm exam as described above will result in a grade of 0% for the exam unless for illness, accident, or family affliction. Students who miss the midterm exam for one of the legitimate, documented reasons listed (described more below) will write a deferred midterm exam within *approximately* 10 business days of the midterm date.

N grades
Students who have completed the following elements will be considered to have completed the course and will be assigned a final grade: The Midterm and the Final Exam.

Failure to complete one or more of these elements will result in a grade of "N" regardless of the cumulative percentage on other elements of the course. An N is a failing grade, and it factors into a student's GPA as 0. The maximum percentage that can accompany an N on a student's transcript is 49.

Therefore, you must write the midterm exam and the final exam to pass the course.
Furthermore, if you have any emergency or any situation (**That may include but not limited to**; illness, mental health and wellness, or lack of access to information. Please also see the link below on concessions for more details) that will in anyway affect your ability to attend (or have attention to) online classes or exams, please contact me (**there is no need for you to give me any description of your situation**) as soon as possible (email or phone). If it's after the midterm and affects your ability to complete the course or for the final exam please download and complete an academic

concession form from Uvic's website: https://www.uvic.ca/registrar/students/appeals/acad-concession/index.php . Deferral of a final exam must be requested with this Academic Concession form and submitted directly to Undergraduate Records. **Deferred final exams will be arranged by the instructor in the first two weeks of January**. Travel is not an acceptable reason to miss the deferred final exam date.

Your total mark, calculated from the marks on all of the exams and BrightSpace in class/assigned questions according to the weighting scheme above, will be converted to a percentage and then to a letter grade (please see the grade information below).

Your final overall mark in the course will be given as a percent and a Letter Grade based on the following guidelines: A+ = 90-l00%, A = 85-89.9%, A- = 80-84.9%, B+ = 77-79.9%, B = 73-76.9%, B- = 70-72.9%, C+ = 65-69.9%, C = 60-64.9%, D = 50-59.9%, F = 0-49.9% (if all requirements completed), N (if not all requirements completed). Please see details below.

You are not allowed to cheat or plagiarize in this course, as outlined in the University of Victoria calendar. This course will strive to be an inclusive and safe learning environment recognizing the diversity of the students and their opinions as outlined in the University calendar.

For questions regarding lecture material, students should go to the instructor for that particular topic. General concerns and questions about marks should be addressed to Dr. Walter as course administrator.

Revised UVic Grading Scheme is below (effective May 1, 2012):

Passing Grades	Grade Point Value	Percentage for Instructor Use Only *	Description
A+ A A-	9 8 7	90 – 100 85 – 89 80 – 84	**Exceptional**, **outstanding** and **excellent** performance. Normally achieved by a minority of students. These grades indicate a student who is self-initiating, exceeds expectation and has an insightful grasp of the subject matter.
B+ B B-	6 5 4	77 – 79 73 – 76 70 – 72	**Very good**, **good** and **solid** performance. Normally achieved by the largest number of students. These grades indicate a good grasp of the subject matter or excellent grasp in one area balanced with satisfactory grasp in the other area.
C+ C	3 2	65 – 69 60 – 64	**Satisfactory**, or **minimally satisfactory**. These grades indicate a satisfactory performance and knowledge of the subject matter.

D	1	50 – 59	**Marginal** Performance. A student receiving this grade demonstrated a superficial grasp of the subject matter.
F	0	0-49	**Unsatisfactory** performance. Wrote final examination and completed course requirements; no supplemental.
N	0	0-49	Did not write examination or complete course requirements by the end of term or session; no supplemental.

Students are expected to take notes during class, copies of slides will be provided on Brightspace before class, however these notes should not be considered complete, and students are responsible for all material discussed online. Plagiarism and copying are all academic offences and submitted material must be your own work. Students must abide by the UVic academic regulations and observe standards of 'scholarly integrity' (no plagiarism or cheating).

Grading will be based on answering short and long answer exam questions. The exams will test your ability to think and incorporate concepts and ideas, and design experiments. Understanding of material will be tested and memorizing the lecture handouts will not be sufficient. You are expected to have completed 3rd year Cell biology and Biochemistry, and the onus is on you to review pertinent material as needed.

Territory acknowledgement:
All the instructors involved with Biol 465 acknowledge with respect the Lekwungen peoples on whose traditional territory the university stands and the (Songhees and Xʷsepsəm/Esquimalt) and W̱SÁNEĆ Peoples on whose territories we live, learn and work and whose historical relationships with the land continue to this day. Please see:
https://www.uvic.ca/services/indigenous/facultystaff/territory-acknowledgment/index.php

Support services:
If you are in need of support, there are support services on campus to help you: Please see any of the following: Centre for Academic Communication https://www.uvic.ca/learningandteaching/cac/
Math-assistance Centre https://www.uvic.ca/science/math-statistics/current-students/undergraduate/msac/index.php
Counselling Services https://www.uvic.ca/services/counselling/
Health Services https://www.uvic.ca/services/health/
Library https://www.uvic.ca/library/
Ombudsperson https://www.uvic.ca/universitysecretary/senate/appeals/ombudsperson/index.php
Computer Help Desk https://www.uvic.ca/systems/about/academic/helpdesk/index.php
Spiritual Health/Meditation https://test.uvic.ca/student-wellness/our-services/spiritual-health/index.php

Centre for Accessible Learning:
Accessible Learning: The University of Victoria is committed to creating a learning experience that is as accessible as possible. If you anticipate or experience any barriers to learning in this course, please feel welcome to discuss your concerns with me. If you have a disability or chronic health

condition, or think you may have a disability, you may also want to meet with an advisor at the Centre for Accessible Learning (CAL). You can find more information about CAL here: https://www.uvic.ca/services/cal/

Online conduct statement:
The University of Victoria is committed to promoting critical academic discourse while providing a respectful and supportive learning environment. All members of the university community have the right to this experience, and the responsibility to help create such an environment. The University will not tolerate racism, sexualized violence, or any form of discrimination, bullying or harassment.

Please be advised that by logging into UVic's learning systems and interacting with online resources you are engaging in a university activity. All interactions within this environment are subject to the university expectations and policies. Any concerns about student conduct may be reviewed and responded to in accordance with the appropriate university policy. To report concerns about online student conduct: onlineconduct@uvic.ca

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Provisional Lecture Schedule 2025 (Changes will be necessary)

Week 1: SEMESTER STARTS Wed Sept. 3 ENDS Wed Dec. 3 2025

1. Wed Sept 3. Introductions/Outline/Cancer Overview – Walter.
2. Fri Sept 5. Introduction to concepts, terms, and overview of Cancer, defining the hallmarks – Walter

Week 2:

3. Tues Sept 9. Hallmarks of cancer – 1st hallmark – self-sufficiency in growth factors - Walter
4. Wed Sept 10. Oncogenes & tumor suppressors how they relate to the hallmarks of cancer - Walter
5. Fri Sept 12. Self-sufficiency in growth signals, HER2 / EGF - Walter

Week 3:

6. Tues Sept 16. The Hallmarks of Cancer - Oncogenes, RTK & Ras – Walter

Tues. Sept 16. **Last day for 100% reduction of tuition fees for first term and full year courses**

7. Wed Sept 17. Ras and Insensitivity to Antigrowth Signals – Walter

Fri Sept 19 Last Day for adding courses that begin in the second term

8. Fri Sept 19. Vitamin D, the immune system and cancer – Walter

Week 4:

9. Tues Sept 23. Vitamin D and Cancer – Walter – Possible intro to immune system
10. Wed Sept 24. Vitamin D, The immune system, Immunoediting in Cancer – Walter
11. Fri Sept 26 T-cell infiltration and favorable prognosis, Evasion of apoptosis in Cancer – Walter

Week 5:

Tues. Sept 30. Last day for paying first term fees without penalty

Tues. Sept 30. National Day for Truth and Reconciliation, UVic closed.

12. Wed Oct 1. Evasion of apoptosis and ferroptosis in Cancer, p53 – Walter
13. Fri Oct 3. P53, Bcl-2 proteins – Walter

Week 6:

Tues Oct 7th Last Day for 50% reduction of tuition fees for standard courses

14. Tues Oct 7. Senescence and inflammation, Cell-cell interaction – Walter
15. Wed Oct 8. Inflammation and ECM. – Walter
16. Fri Oct 10. DNA repair and Tumor metabolism and the immune system in cancer. The immune system and cancer – Walter

Week 7

Monday Oct. 13. Thanksgiving Day

17. Tues Oct 14. DNA repair and Tumor metabolism and the immune system in cancer and Review - Walter
18. Wed Oct 15. Hypoxia and tumor metabolism, TME and chronic inflammation – Amereh
19. Fri Oct 17. Immune system and cancer AND Review / Practice midterm – Walter

Week 8:

20. Tues Oct 21 **Midterm 32% -** Walter
21. Wed Oct 22. DNA damage and cancer - Walter
22. Fri Oct 24. DNA damage and cancer – Walter

Week 9:

23. Tues Oct 28 Tumor metabolism in cancer – Walter
24. Wed Oct 29. Finish tumor metabolism - Inherited Cancers – Lum

Friday Oct 31. Last Day to Drop Courses without Failure

25. Fri Oct 31. Synthetic Lethality – Lum

Week 10:

26. Tues Nov 4. Ovarian Cancer topics/stem cells – Lum
27. Wed Nov 5. Immunogenomics – Lum

28. Fri Nov 7. T Cell Therapy – Lum

Week 11:

Mon, Nov. 10 – Wed 12 Reading break.

Tues Nov 11, Remembrance Day University closed Mon Nov 11

29. Fri Nov 14. Cell Engineering & Cancer Immunotherapy – Lum

Week 12:

30. Tues Nov 18. Angiogenesis – Lum
31. Wed Nov 19. Autophagy – Lum
32. Fri Nov 21. Cancer Clinical Trials - Lum

Week 13:

33. Tues Nov 25. TAMs and Breast cancer - Reading Assignment 2 – Walter
34. Wed Nov 26. "Targeting macrophages sensitizes CLL cells to death and inhibits Disease Progression"–Walter
35. Fri Nov 28. Finish Targeting TAMS Breast Cancer and LAN – Walter

Week 14:

36. Tues Dec 2. Biomarkers and Molecular Pathology of Breast cancer – Peter Watson
37. Wed Dec 3. Breast cancer and LAN - Walter - Last day of classes all faculties

Wed Dec. 3 National Day of Remembrance and Action on Violence Against Women. Classes cancelled from 11:30 am to 12:30 pm.

FINAL EXAMS Sat DEC. 6 – Fri Dec. 20