

Biology of Cancer

BIOL 4683

Instructor: Dr. Russell Easy



Lecture: T,Th Carnegie 207, 9:30 – 10:50

Office: Biology 432

Office hours: T, Th 11:00am -2:00pm

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| Points | Description |
|--------|--|
| 30% | Students will have a choice to review a research article relevant to cancer research and write a paper on the article OR write a book review on one of the suggested texts. Due December 4 th |
| 20% | Student presentation: students will direct a classroom presentation/discussion on their paper. Dates to be determined |
| 20% | Diagnostic exercise: students will be the physician and diagnostician and write a 2 page diagnoses identifying the disease and provide a proposed treatment – if any. |
| 10% | Short paper on speaker: Students will write a 1-2 page summary on one of the invited speakers. Due December 4 th |
| 20% | Classroom participation/discussions: Throughout the semester students will work in groups to answer question presented by the instructor. These will be spontaneous sessions and will initiate discussion on the most relevant topics in cancer biology from the scientific to the social aspects. Students are strongly encouraged to attend every class to keep up on the discussion thread. |

Part 1: Course Information

Course Description

Welcome to Biology of Cancer. This course will explore the cellular and molecular basis of cancer. Topics will include the various forms of cancer, genetics of cancer, and historical and modern treatment strategies. The goal is to remove the mystery behind cancer and understand the biological processes behind development, diagnoses and treatment of cancer.

Cell replication is one of the most essential biological processes. Errors in cell replication can lead to uncontrolled cell division, which is the very definition of cancer. Through lectures, directed readings, presentations, guest speakers and class discussions this course will explore the cellular and molecular processes that can lead to the formation of cancer. Current targeted strategies for treating cancer such as chemotherapy, immunotherapy, and radiation therapy among others will be discussed. Students will be graded based on exercises exploring their comprehension of the materials presented and through discussions and oral presentations. Students will also be asked to select a specific cancer-related illness and provide a paper and an oral presentation exploring etiology, diagnoses and treatment strategies. Thus, evaluations will consist of in-class tests, assignments and presentations. Guest speakers will provide students with a broad perspective of cancer including the social challenges of dealing with cancer in the modern era.

Prerequisite

BIOL 3613. The BIOL course(s) used as a prerequisite must be completed with a minimum grade of C-.

Course Materials & Requirements

The instructor will provide published papers and book suggestions for students' review and discussion. Principles of Genetics, 6th ed., Snustad & Simmons, Wiley publishers can be used as a guide.

Access to ACORN and a computer or tablet to take online quizzes and tests (please let instructor know if this is an issue)

Course Structure

Lecture time will be used for activities, discussion, and instruction. **In-person attendance is strongly encouraged** as classroom participation/discussions are 20% of the final mark.

Lecture material will be presented in 80 min lecture slots.

Student Learning Outcomes

1. Broaden students' knowledge in cancer and cancer research.
2. Comprehend the environmental triggers and risks involved in the establishment of cancer.
3. Understand the processes of metastasis and those physiological elements that can lead to the spread of cancer.
4. Explore and critically analyse cancer therapies over the last several decades of research.
5. Explain the principles behind and the essential experimental techniques in modern cancer studies.
6. Develop the ability to apply existing knowledge to research on the treatment of cancer – interpret clinical results of experiments and analyses in cancer research.
7. Critically discuss the challenges across the world in treating cancer.
8. Apply the scientific method to address research questions within the field of cancer science.
9. Gain a better understanding of the social elements of cancer and the challenges of cancer care in the health network.

How to Meet the Learning Outcomes

1. Attend lectures, take notes, and participate in class activities/group work.
2. Keep up with materials and activities posted for each unit on ACORN.
3. Study on a regular basis.
4. Read suggested material/handouts in advance, participate in classroom discussions.
5. Review speakers' biographies and web pages.

Part 2: Topic Outline**Section 1: What is Cancer?**

Introduction: What is cancer? - Types of cancer
Etiology and epidemiology of cancer
The cellular hallmarks of cancer - role of mutation and viruses

Section 2: Topics in Cancer Treatment

A history of diagnoses and treatments
Modern treatments for cancer (e.g. CAR-T, Immunotherapy, RCHOP, REPOCH)

Section 3: Cancer and You

The social elements of cancer – bench to bedside - patient support initiatives.
Ethics of cancer research and treatment.
Recap and what's next?

NOTE: In consultation with the class, the instructor reserves the right to amend the above course plan with reasonable notice to you.

Part 3: Assessment and Grading

The assessment schedule is listed at the beginning of the syllabus.
<https://registrar.acadiau.ca/RecordsandOtherRequests.html>

Part 4: Course Policies

Students are expected to attend all class sessions as listed above.

Part 5: University Policies

University policies are available in the Acadia University Academic Calendar or through the Registrar's website: <https://registrar.acadiau.ca/welcometotheregistrarsoffice.html>

Equity, Diversity and Inclusion

Acadia University is committed to becoming a culturally safe and anti-oppressive community. This can only be achieved where there are simultaneous efforts to eliminate all forms of discrimination and harassment from our campus community, including the elimination of all discrimination, harassment and violence based on one's identity, including but not limited to, gender, race, class, ethnicity, sexual orientation, disability, gender identity, gender expression, and Indigeneity. The policy against harassment and discrimination, and resources for students who believe they may have experienced, or witnessed, discrimination or harassment, are available here: <https://www2.acadiau.ca/student-life/equity-judicial/equity.html>

Last Drop Day

Last day to drop a course and receive a "W". Please check the Acadia University calendar dates, which are available here: <https://registrar.acadiau.ca/AcademicCalendars.html>

Inform Your Instructor of Accommodations

Acadia University is dedicated to improving access to campus life for all students with disabilities. While we attempt to ensure that all courses are accessible, we recognize that there are barriers that need to be addressed on an individual basis. Students who require accommodations to complete coursework or otherwise fully participate in class should contact Accessible Learning Services directly as soon as possible.
<https://www2.acadiau.ca/student-life/accessiblelearning.html>

The Use of Animals in Teaching and Research

The use of animals in teaching and research at Acadia University is done in accordance with guidelines on the care and use of animals published by the Canadian Council on Animal Care (CCAC). For more information on the CCAC, please visit their website at <http://www.ccac.ca>

Commitment to Integrity

If you are feeling stressed (and tempted to use an unauthorized aid or someone else's work), contact me for an extension and/or support.

Cheating in the class will not be tolerated. Please read the appropriate sections of the current Acadia University Academic Calendar: <https://registrar.acadiau.ca/AcademicCalendars.html>

Information on copy-write and course content from Acadia University is available through the Vaughan Memorial Library: <http://libguides.acadiau.ca/c.php?g=433650&p=5027078>

The spoken and written course content (including the syllabus, handouts, lectures, presentations, assignments, quizzes, tests, and exams) are the intellectual property of the instructor and may only be copied for personal use. Sharing these materials or uploading them where they may be accessed by others is a violation of copyright. If you wish to make audio, video, or photographic recordings in class, you must first obtain the consent of the instructor and of any other persons (e.g., guest speakers, other students) who may be captured in such recordings. In the case of personal use by students with disabilities, the instructor's consent shall not be unreasonably withheld.

Part 6: Program Learning Outcomes

| Foundations of knowledge | | Course specific examples | Proficiency 1-Introduction 2-Reinforcement 3-Proficient |
|--|---|--|--|
| Scientific method, inquiry and hypothesis testing | Find, understand and apply information from the literature; understand how to use the scientific method to examine problems from different perspectives | Process of discovering the role of basic research in identifying and treating uncontrolled cell replication. Discussion of epidemiological data figures from literature | 1 |
| Historical concepts and contributions by important figures | Explain foundational concepts in biology, and ethical implications of scientific discoveries | Key discoveries in cancer research biochemistry and the major thinkers and innovators in the field. Nobel prize winners and their contributions to cancer research. | 1 |
| Biodiversity and ecology | Understand the genetic, taxonomic and ecosystem levels of biodiversity; focus on SW Nova including the Acadian Forest and Bay of Fundy ecosystems | Investigate the ecology of the tumor environment and the adaptive functions that allow cancer to exist in a biologically hostile environment. | 1 |
| Genetics and evolution | Understand the chemical basis of heredity, genetics and genomics; integrate concepts across disciplines to understand evolution | Explore the evolution of the cancer process and the role of mutations in progression, Explore the phenomenon of transmissible cancers and the implications in cancer neogenesis. | 1 |
| Human and environmental health | Understand form and function in health and disease within a One Health framework, integrating human and environmental health | Explore the social aspects of cancer and the historical view of cancer prognosis and treatment. | 1 |
| Data acquisition, analysis and interpretations | Collect data, present results both qualitatively and quantitatively, and interpret outcomes in light of the literature | Analysis of figures, health tables, charts. | 2 |
| Statistical analysis | Use R and or other programs to analyze biological data | As required. | |

| Professional skills | | | |
|------------------------------|---|---|---|
| Ethical practices | Demonstrate ethical conduct, apply principles of academic integrity and understand the principles of EDI in science | Respectful participation in classroom discussions, proper citations, professional email and other communication | 1 |
| Collaboration and group work | Work effectively in groups within and across disciplines | Group collaboration in class activities such as small group discussions, case studies and review work | 1 |
| Critical thinking | Analyze and evaluate information to make science-based decisions | Question response, discussions on current research and past discoveries. | 1 |
| Computer proficiency | Use common and discipline- specific software | As applicable | |
| Scientific communication | Communicate science effectively to both scientific and general audiences | Class small group discussions, written hand-ins, in-class written responses to prompts | 2 |