

RXRS 410: Cancer Biology and Pharmacotherapy Fall 2023

Instructor:	Amanda M. Burkhardt, PhD aburkhar@usc.edu
Course Weight:	4 Units
Office Hours:	See announcement on course Blackboard page
Day/Time/Location:	Tuesday & Thursday 9:30a-10:50a, THH 219

Catalogue Description

Cancer is a heterogenous group of diseases that strikes fear in many people and is a diagnosis that is becoming more common over the course of a standard lifetime. This course introduces students to the molecular basis of oncogenesis and potential metastasis of transformed cells. By understanding this process, we can begin to understand what chemotherapeutic agents are used to manage different cancers, how they exert their anti-cancer effects, what side effects can be expected, and why some are more appropriate than others in different types of cancer. Furthermore, this course will discuss cutting edge, emerging chemotherapeutic agents that are continuing to transform the treatment landscape of this complex group of diseases.

Learning Objectives

- Understand the molecular and genetic basis of tumorigenesis, invasion, and metastasis
- Understand the types of gene mutations and they can contribute to cancer formation
- Understand what oncogenes are and the role they play in cancer development
- Understand how tumors evade detection and destruction by the immune system
- Apply knowledge of the molecular basis of cancer to understand the target site(s) and mechanisms of action of therapeutic modalities
- Apply the preclinical and clinical drug development process from therapeutic target to marketable drug
- Evaluate the risk versus benefits of various anticancer therapeutic modalities
- Understand the role of clinical trials in cancer drug development
- Evaluate why so many experimental cancer therapeutics fail to reach the market

Evaluation and Grading

Evaluation will be based on one Midterm Exam, one Final Exam, three Learning Checks and five student-led discussions.

<i>Description</i>	Points	Weight
<i>Learning Checks (3 at 10 points each)</i>	30 pts	15%
<i>Midterm Exam</i>	50 pts	25%
<i>Final Exam</i>	70 pts	35%
<i>Student Discussions (5) at XXX points each</i>	50 pts	25%
Total	200 pts	100%

Exams

15% Learning Checks: There will be three Learning Checks throughout the semester. These “no stakes” exams are designed to provide students with feedback on how they are processing the course material ahead of “high stakes” exams (midterm, final). Students will receive full credit on the Learning Checks if they complete the exam in full, regardless of how many questions a student answers correctly. Students are strongly encouraged to use the information from these exams to guide their study of course material and “high stakes” exam preparation. Learning Checks exams will be completed asynchronously, outside of class meeting time and accessed through the course Blackboard page. Question styles can include multiple choice, multiple answer, True/False, and fill-in-the-blank. Each Learning Check will test material prior to the day it is given (i.e. Learning Check 1 will test material in Lectures 1-4, Learning Check 2 will test material in Lectures 1-11, etc).

25% Midterm: There will be one Midterm exam for this course that will test material covered through the first six weeks of the course. The exam can include multiple choice, multiple answer, True/False, fill-in-the-blank, and short answer style questions. This exam will allow students to assess their own comprehension of course material and, if necessary, make adjustments in their exam preparation ahead of the Final exam.

35% Final: The Final exam will test material covered in the entire course (i.e. a comprehensive exam), with a focus on untested material from Weeks 7 to 15. The content of the student-led discussions will also be tested. The exam can include multiple choice, multiple answer, True/False, fill-in-the-blank, and short answer style questions.

Student Discussions

Sign up for roles in EACH discussion by end of Week 4 (sign up on Blackboard). See Blackboard for full assignment description.

Grading Scale

93% to 100%: A	79% to 81%: B-	65% to 67%: D+
90% to 92%: A-	76% to 78%: C+	62% to 64%: D
87% to 89%: B+	71% to 75%: C	55% to 61%: D-
82% to 86%: B	68% to 70%: C-	0% to 54%: F

DRAFT

Course Readings

The textbook for this course is Robert A Weinberg's *The Biology of Cancer* (2nd or 3rd edition). The textbook is not required, but is recommended for students who want access to readings that supplement what is covered in lecture and in the student-led discussions.

An electronic version of the 3rd edition of *The Biology of Cancer* is available for purchase from the publisher (W.W. Norton) at a discounted price from the physical textbook.

Course Attendance

Attendance at all classes is expected. Due to the unpredictability of technology, it cannot be guaranteed that a Zoom recording will be available for each class meeting.

Students who are unable to attend class on their assigned presentation day will complete an Alternative Assignment (see assignment description on Blackboard).

Course Outline

Week	Date	Lecture	Deliverable
Week 1	Tues. Aug. 22	Introduction to course, biology and genetics of cells review	
	Thur. Aug. 24	The nature of cancer	
Week 2	Tues. Aug. 29	Tumor viruses	
	Thur. Aug. 31	Cellular oncogenes	
Week 3	Tues. Sept. 5	Growth factors and receptors	Learning Check 1 Asynchronously Exam open on Blackboard 2:00p-7:00p PST
	Thur. Sept. 7	Cytoplasmic signaling	
Week 4	Tues. Sept. 12	Tumor suppressor genes	
	Thur. Sept. 14	pRb and cell cycle control	Deadline to sign up on Blackboard for roles in each student discussion
Week 5	Tues. Sept. 19	P53 and apoptosis	
	Thur. Sept. 21	Cell immortalization and tumorigenesis	
Week 6	Tues. Sept. 26	Multi-step tumorigenesis	Learning Check 2 Asynchronously Exam open on Blackboard 2:00p-7:00p PST
	Thur. Sept. 28	Maintenance of genetic integrity and the development of cancer I	
Week 7	Tues. Oct. 3	Maintenance of genetic integrity and the development of cancer I	
	Thur. Oct. 5	Heterotypic interactions and the biology of angiogenesis	
Week 8	Tues. Oct. 10	MIDTERM EXAM In class	
	Thurs. Oct. 12	FALL RECESS	
Week 9	Tues. Oct. 17	Invasion and metastasis	
	Thurs. Oct. 19	Tumor immunology	
Week 10	Tues. Oct. 24	Management of side effects from cancer therapeutics	
	Thurs. Oct. 26	Cancer therapeutics I	
Week 11	Tues. Oct. 31	<i>Student-led discussion I</i>	
	Thurs. Nov. 2	Cancer therapeutics II	Learning Check 3 Asynchronously Exam open on Blackboard 2:00p-7:00p PST
Week 12	Tues. Nov. 7	<i>Student-led discussion II</i>	

	Thurs. Nov. 9	Cancer therapeutics III	
Week 13	Tues. Nov. 14	<i>Student-led discussion III</i>	
	Thurs. Nov. 16	Cancer therapeutics IV	
Week 14	Tues. Nov. 21	<i>Student-led discussion IV</i>	
	Thurs. Nov. 22	THANKSGIVING HOLIDAY	
Week 15	Tues. Nov. 28	Cancer therapeutics V	
	Thurs. Nov. 30	<i>Student-led discussion V</i>	
Saturday, December 2 to Tuesday, December 5, 2023– Study Days			
FINAL EXAM: THURSDAY 12/07/23 11:00AM-1:00PM			

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment. Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relationship to the class, whether obtained in class, via email, on the internet, or via any other media. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Academic Integrity:

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Statement on Academic Conduct and Support Systems

Academic Integrity:

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-5086 or (213) 821-8298

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call
Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.

DRAFT