

PCB 3109 Cancer Biology

Contact Information

Instructor

David G. Oppenheimer, PhD

Phone Number

352-273-0121

Email

oppenhe@ufl.edu

Office Hours

By appointment, via Zoom. Send an email or a message on Canvas to schedule an appointment.

Credit Hours

3

Course Information

In this course, we will introduce the dysregulation of cellular processes in cancer cells including the mechanisms of action of anti-cancer drugs. By the end of this course, you will be able to explain the concepts and theories of cancer biology, as well as understand the basic methods used by cancer researchers. You will apply knowledge of basic cellular principles to solve problems in cell and cancer biology throughout the course.

Course Objectives

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

- build a concept map.
- explain how mutations cause cancer.
- draw the structures of the major cellular macromolecules.
- identify the forces and bonds responsible for the four levels of protein structure.
- infer how mutations affect protein structure and function.
- explain how lipids act as signaling molecules.
- model a cellular membrane.
- illustrate the flow of lipid and protein through the endomembrane system.

- predict changes to membrane structure in cancer cells.
- explain how protein levels are controlled by the ubiquitin-proteasome system. illustrate - the stages of the cell cycle and the locations of checkpoints.
- understand the relationship between loss of checkpoint control and cancer.
- predict the progression through the cell cycle of checkpoint-defective cells.
- compare and contrast oncogenes and tumor suppressor genes.
- compare the components of the major signaling pathways.
- predict the outcome of inappropriate activation of signaling pathways.
- define the role of the cytoskeleton in cancer development.
- outline the elements of the extracellular matrix and explain their role in tumor growth. - summarize how metabolism in cancer cells is altered.
- elaborate on how altered cancer cell metabolism can be used for diagnosis.
- explain how cancer cells avoid apoptosis.
- design a strategy for cancer drug discovery using synthetic lethality.
- analyze protein structure in PyMOL.
- distinguish between a lead-driven and target-driven drug discovery approach. design an *in - silico* anti-cancer drug screen.
- evaluate the results of a ligand-protein docking experiment.

Course Requirements

Required Textbook

Becker's World of the Cell 9th Edition by Jeff Hardin, Gregory Paul Bertoni, and Lewis J. Kleinsmith. Pearson (Publisher)

You need to purchase Mastering Biology through UF All Access. With UF All Access you get access to Mastering Biology (homework and some activities), Learning Catalytics (quizzes), and an e-book version of the textbook. You are not required to purchase a physical copy of the textbook for this course.

For directions on how to purchase through UF All Access and access your textbook, read Registering for and Accessing MyLab and Mastering Biology (<https://ufl.instructure.com/courses/423389/pages/registering-for-and-accessing-mylab-and-mastering-biology>).

Prerequisites

A grade of "C" or better in Integrated Principles of Biology I and II (BSC 2010, BSC 2011, BSC 2010L, BSC 2011L).

In this course, we build upon the introduction to cell biology, biochemistry, and genetics that you received in BSC 2010, with a focus on structure-function relationships. Please review the material presented in BSC 2010, if a topic is unfamiliar to you.

Minimum Technology Requirements

The University of Florida expects students entering an online program to acquire computer hardware and software appropriate to his or her degree program. Most computers are capable of meeting the following general requirements. A student's computer configuration should include:

- Webcam
- Microphone
- Broadband connection to the Internet and related equipment (Cable/DSL modem) Microsoft - Office Suite installed (provided by the university)
- Individual colleges may have additional requirements or recommendations, which students - should review prior to the start of their program.

You will also be required to use PyMOL, a premier molecular visualization software package that allows you to view and manipulate protein structures. Static, 2D images of protein structures in textbooks are useful representations, but manipulation of 3D structures greatly facilitates the learning process, and provides a deeper understanding of how the atoms and functional groups interact with each other. Like most software, learning how to use PyMOL to do routine tasks takes time, and the PyMOL assignments are designed to help students achieve proficiency in these routine tasks in the shortest time possible.

PyMOL is available for student in this class through UF Apps (<https://apps.ufl.edu/Citrix/UFAppsWeb/> (<https://apps.ufl.edu/Citrix/UFAppsWeb/>)). Visit the UF Apps information page (<https://info.apps.ufl.edu/> (<https://info.apps.ufl.edu/>)) to get started.

Visit the following pages for getting started with PyMOL:

1. PyMOL for Beginners - video 1: orientation ([youtube.com/watch?v=wiKyOF-pGw4](https://www.youtube.com/watch?v=wiKyOF-pGw4) (<https://www.youtube.com/watch?v=wiKyOF-pGw4>))
2. PyMOL for Beginners - video 2: labels ([youtube.com/watch?v=nFY3EjBNPBQ](https://www.youtube.com/watch?v=nFY3EjBNPBQ) (<https://www.youtube.com/watch?v=nFY3EjBNPBQ>))
3. PyMOL for Beginners - video 3: measurements ([outube.com/watch?v=IB-0WsZt8M8](https://www.youtube.com/watch?v=IB-0WsZt8M8) (<https://www.youtube.com/watch?v=IB-0WsZt8M8>))
4. PyMOL for Beginners - video 4: H-bonds ([youtube.com/watch?v=xUdETtfhens](https://www.youtube.com/watch?v=xUdETtfhens) (<https://www.youtube.com/watch?v=xUdETtfhens>))
5. PyMOL - video 5: Working with Scenes ([youtube.com/watch?v=0fIZh4NFOAo](https://www.youtube.com/watch?v=0fIZh4NFOAo) (<https://www.youtube.com/watch?v=0fIZh4NFOAo>))

Minimum Technical Skills

To complete your tasks in this course, you will need a basic understanding of how to operate a computer, and how to use word processing software, as well as the stated programs above.

Microsoft Office programs are required for some of the assignments; these can be accessed by current UF and UFO students through GatorCloud (<https://it.ufl.edu/gatorcloud/>). Assignment submissions must be made either in an MS Office format (.docx , .ppt , etc.) or in a generally readable file format (.pdf , .jpg , .txt , etc.); proprietary file formats such as Pages, Keynote, etc. cannot be opened and will not count as an on-time submission.

Materials/Supply Fees

There is no supply fee for this course.

Honorlock

Honorlock is an online proctoring service that allows students to take exams on-demand 24/7. There are no scheduling requirements or fees.

You will need a laptop or desktop computer with a webcam, a microphone, and a photo ID. The webcam and microphone can be either integrated or external USB devices.

Honorlock requires that you use the Google Chrome (<https://www.google.com/chrome/>) browser; furthermore, **the Honorlock extension must be added to Chrome.**

For further information, FAQs, and technical support, please visit the Honorlock website (<http://Honorlock.com/students>).

Zoom

Zoom is an easy to use video conferencing service available to all UF students, faculty, and staff that allows for meetings of up to 100 participants.

You can find resources and help using Zoom at <https://ufl.zoom.us> (<https://ufl.zoom.us>).

Course Policies

Requirements for make-up exams, assignments, and other work in this course are consistent with university policies that can be found at <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/> (<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>).

As this is an online class, you are responsible for observing all posted due dates, and are encouraged to be self-directed and take responsibility for your learning.

Classroom Behavior

Please behave with courtesy towards your fellow students and the instructors. This is particularly important in discussion boards where you are voicing opinions and commenting on those of other students. Students who persist in being rude or disrespectful will be blocked from future participation.

Grammar

Correct grammar, punctuation, spelling, capitalization, and paragraphing should be used in any college-level submission, including the discussion boards. (U SHLD NT US TXT SPEAK LKE IDK OR BFF THX ALSO DNT USE ALL CAPS.) The instructor will take note of spelling and grammar in all submissions and it will affect grading, even if it is not explicitly included on the rubric. If you need help with any aspect of your writing, please visit the UF Writing Studio (<http://writing.ufl.edu/writing-studio/>).

Course Materials

All materials for this course, including but not limited to lectures, quizzes, and worksheets, are the intellectual property of the professor, textbook publisher, or UF and are provided solely for the personal use of the currently enrolled students. These materials may not be distributed to other students or repositories without express written permission, even after the conclusion of the course at the end of the semester. Doing so will be considered a violation of the UF Honor Code (see below).

Time Commitment

The UF College of Liberal Arts and Sciences assumes that each student will devote on average 3-4 hours per week per credit-hour to each course during the regular semester. Because BSC 2005 is 3 credits, each student should therefore expect to devote an average of 9-12 hours per week to this course in a 15-week semester. This time will not necessarily be evenly distributed; some weeks will have heavier workloads than others.

Attendance

Students are expected to complete all assigned work (quizzes, interactive, discussions, activities etc.) by the due date. Students with pre-planned travel/conflicting activities on the day of the deadline (including student athletes) are responsible for managing their time wisely and should plan to work ahead when needed so that they can submit their work before they leave. Excuses such as “we didn’t get back from (activity) when planned and I didn’t have time” or “my computer crashed half an hour before the deadline and tech support wasn’t open” will NOT be accepted as excuses for missed deadlines.

Unavoidable emergency circumstances (e.g. hospitalization or family emergencies) that prevent you from completing your work in a timely manner require you to obtain a letter from a medical professional or the Dean of Students office (<https://care.dso.ufl.edu/instructor-notifications/>) that specifies the time period for which you are excused from classwork, and submit it to your instructors as soon as possible (i.e. within a week, barring extreme circumstances like extended hospitalization).

Course Technology

This course is facilitated 100% online through Canvas. You may access Canvas from UF’s e-Learning webpage: <http://elearning.ufl.edu/> (<https://elearning.ufl.edu/>). Please contact the UF Help Desk, <https://helpdesk.ufl.edu/> (<https://helpdesk.ufl.edu/>), if you have any technical difficulties with Canvas.

Grading Policy

I will make every effort to have each assignment graded and posted within one week of the due date. Some of the PyMOL assignments will take extra effort to grade, but we (my TA and I) will make every effort to complete the grading as soon as possible.

Course Grading Policy

ASSIGNMENT	PERCENTAGE
Exams	50%
Assignments (LC and Mastering Biology[1])	25%
Projects/Activities (PyMOL)	25%

Grading Scale

PERCENT	GRADE	GRADE POINTS
90.0 – 100.0	A	4.00
87.0 – 89.9	A-	3.67
84.0 – 86.9	B+	3.33
81.0 – 83.9	B	3.00
78.0 – 80.9	B-	2.67
75.0 – 79.9	C+	2.33
72.0 – 74.9	C	2.00
69.0 – 71.9	C-	1.67
66.0 – 68.9	D+	1.33
63.0 – 65.9	D	1.00
60.0 – 62.9	D-	0.67
0 – 59.9	E	0.00

See the current UF grading policies (<https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>) for more information.

UF Policies

University Policy on Accommodating Students with Disabilities

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://disability.ufl.edu/>) by providing appropriate documentation. Once registered, students will receive an accommodation letter that must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

University Policy on Academic Conduct

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied:

"On my honor, I have neither given nor received unauthorized aid in doing this assignment."

The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies the number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Netiquette and Communication Courtesy

All members of the class are expected to follow rules of common courtesy (https://www.cise.ufl.edu/wp-content/uploads/2019/08/CISE_Netiquette_Guide.pdf) in all email messages, threaded discussions, and chats.

Getting Help

Technical Difficulties

For issues with technical difficulties for Canvas, please contact the UF Help Desk at:

- Online: <https://helpdesk.ufl.edu/>
- Phone: (352) 392-HELP (4357)
- Email: helpdesk@ufl.edu
- Walk-in: HUB 132 Map to the Hub (<https://campusmap.ufl.edu/#/index/0032>)

Any requests for make-ups due to technical issues should be accompanied by the ticket number received from the Help Desk when the problem was reported to them. The ticket number will document the time and date of the problem. You should e-mail your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

Health and Wellness

- **U Matter, We Care:** If you or someone you know is in distress, please contact umatter@ufl.edu (mailto:umatter@ufl.edu), 352-392-1575, or visit <https://umatter.ufl.edu/> (<https://umatter.ufl.edu/>) to refer or report a concern and a team member will reach out to the student in distress.
- **Counseling and Wellness Center:** Visit counseling.ufl.edu (<https://counseling.ufl.edu/>) or call 352-392-1575 for information on crisis services as well as non-crisis services.
- **Student Health Care Center:** Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website (shcc.ufl.edu (<https://shcc.ufl.edu/>)).
- **University Police Department:** Visit police.ufl.edu (<https://police.ufl.edu/>) or call 352-392-1111 (or 9-1-1 for emergencies).
- **UF Health Shands Emergency Room/Trauma Center:** For immediate medical care in Gainesville, call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; ufhealth.org/emergency-room-trauma-center (<https://ufhealth.org/emergency-room-trauma-center>).

Academic and Student Support

- **Career Connections Center:** Career assistance and counseling services, call 352-392-1601 or visit career.ufl.edu/ (<https://career.ufl.edu/>).
- **Library Support:** Various ways to receive assistance with respect to using the libraries or finding resources. Visit cms.uflib.ufl.edu/ask (<https://uflib.ufl.edu/>)
- **Teaching Center:** For information about general study skills and tutoring, call 352-392-2010 or visit teachingcenter.ufl.edu/ (<https://teachingcenter.ufl.edu/>).
- **Writing Studio:** For help brainstorming, formatting, and writing papers, call 352-846-1138 or visit writing.ufl.edu/writing-studio/ (<http://writing.ufl.edu/writing-studio/>).

Course Evaluations

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/> (<https://gatorevals.aa.ufl.edu/students/>). Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/> (<https://ufl.bluera.com/ufl/>). Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/> (<https://gatorevals.aa.ufl.edu/public-results/>).

Tips for Success

Taking a course online can be a lot of fun! Here are some tips that will help you get the most of this course while taking full advantage of the online format:

- Schedule "class times" for yourself. It is important to do the coursework on time each week. You will receive a reduction in points for work that is turned in late!
- Read ALL of the material contained on this site. There is a lot of helpful information that can save you time and help you meet the objectives of the course.
- Print out the Course Schedule located in the Course Syllabus and check things off as you go.
- Take full advantage of the online discussion boards. Ask for help or clarification of the material if you need it.
- Do not wait to ask questions! Waiting to ask a question might cause you to miss a due date.
- Do your work well before the due dates. Sometimes things happen. If your computer goes down when you are trying to submit an assignment, you'll need time to troubleshoot the problem.
- To be extra safe, back up your work to an external hard drive, thumb drive or through a cloud service.

Privacy and Accessibility Policies

For information about the privacy policies of the tools used in this course, see the links below:

- Instructure (Canvas)
 - Privacy Policy (<https://www.instructure.com/policies/privacy>)
 - Accessibility (<https://www.instructure.com/canvas/accessibility>)
- Sonic Foundry (Mediasite Streaming Video Player)
 - Privacy Policy (<https://sonicfoundry.com/privacy-policy/>)
 - Accessibility (<https://mediasite.com/wp-content/uploads/Mediasite-7-Content-Accessibility.pdf>)
- Vimeo
 - Privacy Policy (<https://vimeo.com/privacy>)
 - Accessibility (<https://vimeo.com/blog/post/accessibility-updates-to-the-vimeo-player/>)
- PlayPosit
 - Privacy Policy (<https://api.playposit.com/privacy/>)
 - Accessibility (<https://go.playposit.com/accessibility>)
- Zoom
 - Privacy Policy (<https://zoom.us/privacy>)
 - Accessibility (<https://zoom.us/accessibility>)
- YouTube (Google)
 - Privacy Policy (<https://policies.google.com/privacy>)
 - Accessibility (<https://support.google.com/youtube/answer/189278?hl=en>)
- Articulate
 - Privacy Policy (<https://articulate.com/privacy>)
 - Accessibility (<https://articulate.com/support/article/Articulate-360-FAQs-Accessibility>)
- Microsoft
 - Privacy Policy (<https://privacy.microsoft.com/en-us/privacystatement>)

- Accessibility (https://www.microsoft.com/en-us/accessibility/office?activetab=pivot_1%3aprimar2 (https://www.microsoft.com/en-us/accessibility/microsoft-365?activetab=pivot_1%3aprimar2))
- Adobe
 - Privacy Policy (<https://www.adobe.com/privacy/policy.html> (<https://www.adobe.com/privacy/policy.html>))
 - Accessibility (<https://www.adobe.com/accessibility.html> (<https://www.adobe.com/accessibility.html>))
- Honorlock
 - Privacy Policy (<https://honorlock.com/student-privacy-statement/> (<https://honorlock.com/student-privacy-statement/>))
 - Accessibility (<https://honorlock.com/accessibility-statement/> (<https://honorlock.com/accessibility-statement/>))
- PyMOL
 - Privacy Policy (<https://www.schrodinger.com/privacy-policies> (<https://www.schrodinger.com/privacy-policies>))
 - Accessibility (<http://pymol.sourceforge.net/newman/userman.pdf> (<http://pymol.sourceforge.net/newman/userman.pdf>))

COVID-19 Recorded Course Statement

Our class sessions may be audio-visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials are prohibited.

Canvas Information

Canvas is where course content, grades, and communication will reside for this course.

- Visit ufl.instructure.com (<https://ufl.instructure.com/>)
- For Canvas, Passwords, or any other computer-related technical support contact the IT Service Desk.
 - Online: <https://helpdesk.ufl.edu/> (<https://helpdesk.ufl.edu/>)
 - Phone: (352) 392-HELP (4357)
 - Email: helpdesk@ufl.edu
 - Walk-in: HUB 132 Map to the Hub (<https://campusmap.ufl.edu/#/index/0032>)

Course Schedule

See Canvas for the current course schedule.

Disclaimer: This syllabus represents my current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected.

1. Learning Catalytics Quizzes and Mastering Biology Homework Assignments ↩