Cancer Biology

ZOO 4926 Class Number: 21281 3 credits

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

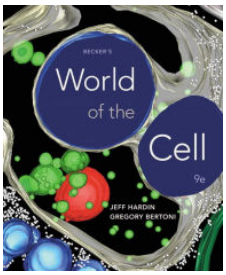
Instructor: David Oppenheimer
Office: 115 Carr Hall
Email: oppenhe@ufl.edu

Class Schedule: Monday, Wednesday, Friday, Period 4 (10:40 AM - 11:30 AM)

Class Location: Psychology (PSY) 0130

Textbook: *Becker's World of the Cell* 9th Edition

By Jeff Hardin, Gregory Paul Bertoni, and Lewis J. Kleinsmith
Pearson (Publisher)



Course website: https://lss.at.ufl.edu/

(Select e-Learning in Canvas) Class material including the syllabus, supplemental readings, and other information related to the course will be posted on the course website on e-Learning.

Office hours: W, F Period 7 (1:55 AM–2:45 PM) or by appointment

Email: All email correspondence must be from your @ufl.edu account, have your full name in the body of the email, and contain the course number in the subject line. Emails not meeting these requirements may not be recognized by my email filters, and thus may not be answered right away.

Course Objectives This course is an introduction to the molecular and cellular basis of cancer. The course will take a mechanistic view of the dysregulation of cellular processes that occurs in cancer cells, including the mechanisms of action of anti-cancer drugs and radiation treatments. This course provides a strong foundation for Biology students, pre-med, and pre-health students. This course will include lectures, in-class activities, and discussions. Topics will include, but are not limited to: dysregulation of the cell cycle, the role of the cytoskeleton and the extracellular matrix in cancer metastasis, oncogenes and cell signaling, tumor suppressors and cell cycle checkpoints, the Warburg effect and cancer cell metabolism, and how our knowledge of these processes is leading to new and effective anti-cancer drugs. Grades will be assigned based on performance on multiple types of assessments including: in-class exams, in-class (clicker) quizzes, homework assignments, and in-class activities. Exams will emphasize material covered in lecture, assigned reading in the textbook, and assigned supplemental information. Quizzes will cover information presented in the previous lecture, and the assigned reading for the current lecture.

Class Attendance

Students are expected to attend all classes and are responsible for all material covered during the lecture. Students are required to read the assigned chapters before coming to class. In class quizzes and problems will be based on the assigned reading.

Exams

There will be 4 Exams during the semester. Exams are not cumulative. Exams will cover the material presented in lecture as well as any assigned supplemental reading or web-based material. Students will be responsible for assigned reading even if it is not specifically covered during the lecture period. The tests will contain multiple-choice questions, and written answer questions. No student will be allowed to start an exam after the first student to complete an exam leaves the classroom. All tests and answer sheets will be collected at the end of the exam period. No additional time will be given to complete an exam. (If you begin an exam late, then you will have less time to complete it.) Exams are available for review for only two weeks after the exam. You may not review previous exams, other than Exam 4, after the semester has ended.

Quizzes

Quizzes will be given during lecture and will be counted as 10% of the course grade (see *Student Response System*, below). The quizzes will cover the material presented during the previous lecture and the assigned reading for the current lecture. There will be no make-up quizzes for any reason. The lowest 10 quiz grades will be dropped.

Make-up Exams

No make-up exams will be given without prior permission or documentation of illness. In case of illness, a note from your physician is required. A personal matter requires a note from the Dean of Students (http://www.dso.ufl.edu/, 202 Peabody Hall). **Make up exams may be given in a short answer format.**

Grading

Course grades will be determined by the scores of the 4 exams plus the quiz scores as follows: Each exam will be 20% of the total course grade (4 exams = 80%). The quiz scores will count as 10% of the course grade, and in-class activities will count for 10% of the course grade. 80% exam scores + 10% quiz scores + 10% activities score = 100% course grade.

A curve for each exam will be calculated as follows: The top three scores on each exam will be averaged, and the difference between that value and the maximum possible value of 100 points will be determined. This curve point value will be added to each exam. At the end of the semester, letter grades will be assigned based upon the percentage of the curved exam grades that you have earned during the semester (plus the quiz scores), using the cut-offs in the adjacent table. These cut-offs may be lowered at the discretion of the instructor, but they will not be increased.

Point Range (%)	Letter Grade
≥ 90.00	A
≥ 86.66	A-
≥ 83.33	B+
≥ 80.00	B
≥ 76.66	B-
≥ 73.33	C+
≥ 70	C
≥ 66.66	C-
≥ 63.33	D+
≥ 60	D
≥ 56.66	D-
< 56.66	E

Student Response System

We will use the Learning Catalytics Classroom Response System for quiz questions during class. Learning Catalytics allows students to use a cell phone (text messaging), laptop, smartphone, Learning Catalytics app, or an iPod touch to participate in class. There will be no make-ups for missed clicker quizzes. For calculating the clicker component of your grade, 90% of the total number of clicker points will be used. If the total clicker points for the semester is 100, then 90 points will be the adjusted total. If you earn 88 clicker points during the semester, then your adjusted clicker score will be 88/90 or 0.978. However, you cannot have an adjusted score above 1.0.

Commented [DO1]: Maybe change this to drop the lowest 5 clicker grades. There were some students who were not happy with the 74% they earned, who felt that I should have scaled the "free points".

Conduct in Class

Please be courteous and **do not talk during lecture** (except during class discussions or activities)**,** as this can be distracting to the professor and the other students. Also, cell phones should be silenced during lecture.

Academic Honesty

All students registered at the University of Florida have agreed to comply with the following statement:

"I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."

In addition, on all work submitted for credit the following pledge is either required or implied:

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

If you witness any instances of academic dishonesty in this class, please notify the instructor, or file an incident report at:

http://www.dso.ufl.edu/sccr/webforms/incidentreport.php.

For additional information on Academic Honesty, please refer to the University of Florida Student Honor Code at:

http://www.dso.ufl.edu/sccr/honorcodes/honorcode.php.

Accommodations for Students with Disabilities

Students with disabilities who require accommodations should first seek assistance at the Dean of Students Office of Disability Resources, in Peabody 202 (phone: 352-392-1261). The Dean of Students Office of Disability Resources will work with the instructor to accommodate the student. Please see the University of Florida Disability Resources website for more information at: http://www.dso.ufl.edu/drc/.

Personal Wellness

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Many students experience test anxiety and other stress related problems. "A Self Help Guide for Students" is available through

	the Counseling and Wellness Center (3190 Radio Road, 352-392-1575). Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.
Career Resource Center	Reitz Union, 352-392-1601, https://www.crc.ufl.edu/next-level/

Lecture Schedule Lecture topics for this course are listed below. This is a flexible, tentative schedule; the dates and amount of coverage of specific topics may vary somewhat from the list below.

Date		Topic	Chapter
		Course Introduction	
Mon 1/7	1	Introduction to the course	
Wed 1/9	2	Introduction to Cancer	26
Fri 1/11	3	Proteins structure and function	3
		Background — Macromolecules	
Mon 1/14	4	Lipids and cancer — lipid signaling	3
Wed 1/16	5	Lipids and cancer — lipid metabolism	Supplemental reading (Hooked on Fat)
Fri 1/18	6	Membrane components	7.1, 7.3-7.4
Mon 1/21		Holiday — no classes	
		Membrane trafficking in cancer	
Wed 1/23	7	Membrane trafficking	12.1-12.7
Fri 1/25	8	Dysregulated vesicle trafficking systems in cancer cells	12.1-12.7,Supplemental reading (highways to cancer)
Mon 1/28	9	The Proteasome and cancer	20, 24, Supplemental reading
		Oncogenes and Cell Signaling	
Wed 1/30	10	G-protein coupled receptors in development of cancer and metastasis	23, 26
Fri 2/1	11	**EXAM 1**	
Mon 2/4	12	Hedgehog signaling and vismodegib	Supplemental reading
Wed 2/6	13	Receptor tyrosine kinases	23.3
Fri 2/8	14	Oncogenes	26.4
Mon 2/11	15	Tumor suppressors	26.4
Wed 2/13	16	Hormone signaling in cancer	23, 26, Supplemental reading
		Tumor Suppressors and the Cell Cycle	
Fri 2/15	17	Overview of the Cell Cycle	24
Mon 2/18	18	The retinoblastoma gene and cell cycle regulation	24, 26
Wed 2/20	19	The DNA damage checkpoint	24, 26
Fri 2/22	20	p53 and DNA damage	24, 26
Mon 2/25	21	BRC1, BRC2 and DNA damage	24, 26
Wed 2/27	**22**	**EXAM 2**	

		Metastasis and the Cytoskeleton	
Fri 3/2	23	Overview of the cytoskeleton	13
Mon 3/4		**SPRING BREAK**	
Wed 3/6		**SPRING BREAK**	
Fri 3/8		**SPRING BREAK**	
Mon 3/11	24	Cytoskeletal regulatory proteins	13, 14
Wed 3/13	25	Cellular motility and metastasis	14, Supplemental reading
Fri 3/15	26	Intermediate filaments and metastasis	13, Supplemental reading
		Extracellular Matrix and the Tumor Microenvironment	
Mon 3/18	27	Overview of the ECM	15
Wed 3/20	28	Regulators of the tumor microenvironment	15, Supplemental reading
		Cellular Metabolism and the Warburg effect	
Fri 3/22	29	Cellular metabolic homeostasis	5, 9, 10
Mon 3/25	30	The Warburg effect	9, 10, Supplemental reading
Wed 3/27	31	Exploiting the Warburg effect for cancer diagnosis and treatment	Supplemental reading
Fri 3/29	32	**EXAM 3**	
		Apoptosis and Synthetic Lethality	
Mon 4/1	33	The cell death pathway	24
Wed 4/3	34	Synthetic lethality: inducing the apoptosis in cancer cells	Supplemental reading
		Cancer Prevention and Diagnosis	
Fri 4/5	35	Carcinogens and DNA damage	26, Supplemental reading
Mon 4/8	36	Epidemiology and Cancer	26, Supplemental reading
Wed 4/10	37	Genomic Screening	26, Supplemental reading
Fri 4/12	38	Infectious agents that cause cancer	26
		Cancer Treatment Strategies	
Mon 4/15	39	Cancer resistance to chemotherapy	26, Supplemental reading
Wed 4/17	40	Cancer Drug discovery	Supplemental reading
Fri 4/19	41	Cancer Drug discovery	Supplemental reading
Mon 4/22	42	Review	
Wed 4/24	**43**	**EXAM 4**	