

## **CELL BIOLOGY OF CANCER - BISC 507 - SPRING 2019**

**LECTURE: Tuesday & Thursday at 9:30 – 10:45 AM in Shoemaker 408**

### **INSTRUCTOR:**

Dr. Brad Jones, Shoemaker 122, 915-1700, [jonesbw@olemiss.edu](mailto:jonesbw@olemiss.edu)

Office hours: Wednesdays 10-12 or by appointment.

### **COURSE DESCRIPTION:**

Cancer cells break the most basic rules of cell behavior through which multicellular organisms are built and maintained. Cancers are characterized by aberrant cell behaviors that include uncontrolled growth, increased division, decreased death, faulty DNA repair mechanisms, and the breakdown of tissue architecture. In this course we will explore the cellular and molecular mechanisms underlying cancer development with the aim of understanding how changes in the normal growth and division processes lead to the formation of tumors. Topics will include the natural history of cancer, oncogenes, tumor suppressors, cancer-causing viruses, growth factor receptors and signaling, the control of cell cycle and cell death, genome maintenance, tumor progression, invasion and metastasis, and current therapeutic approaches to cancer treatment.

This course will combine instructor lectures, discussion of primary literature, and “journal club” style student presentations of journal articles. The lecture period will also incorporate several instructor lead discussions of journal articles from the primary literature. The final week will be devoted to presentations; undergraduates will be grouped to present a single journal article chosen by the instructor. Graduate students will give an individual presentation on a paper of their choice (pending instructor approval). In addition, graduate student will write a mini-review report on a selected topic with critical analysis/synthesis of recently published research material.

### **LEARNING OBJECTIVES:**

After completing this course a student should gain an understanding of the common cellular and molecular genetic mechanisms that are deregulated in cancer cells and how does their deregulation lead to the development of cancer. The student should be able to: 1) describe the characteristics of cancer cells; 2) explain the types of gene mutations that are involved in carcinogenesis; 3) explain how oncogenes act in cancer development; 4) describe the function of tumor suppressor genes; 5) learn how cancer cells escape cell death; 6) explain current approaches in cancer treatment. In addition, students should 1) learn about modern cell biological and molecular techniques and genetic methods, and 2) learn how to effectively read, analyze, and present articles from primary scientific journals.

### **PREREQUISITES:**

*Bisc 372: Introductory Cell Biology, OR Bisc 440: Cell and Molecular Biology.*

### **REQUIRED TEXTBOOK:**

*The Biology of Cancer, Second Edition*, Robert A. Weinberg, Garland Science, 2014. (ISBN 978-0-8153-4220-5) (Garland Science titles are now W.W. Norton)

Additional readings and papers will be posted on Blackboard or distributed in class.

### **EXAMS and GRADES:**

**Exams:** Exams will be based on material covered in lectures, textbook, and other readings. Lectures will be

the primary guide for what will be covered in exams. In addition, there will be questions on exams based on an understanding of journal articles discussed in class. Exams will generally be a combination of multiple choice, fill-in-the-blank, and short answer questions.

**Make-up Exams** will only be given to those students who miss a test because of an official University activity or because of illness, or other excused activities. *Arrangements for a makeup test should be made prior to the absence.* It is your responsibility to contact me in person to schedule a makeup exam. Make-ups are given solely at the instructor's discretion – do not assume that you will be automatically allowed to take a make-up exam. Make-up exams must be taken at a date and time decided by the instructor, generally within 2-3 days of the original exam date.

**Grades:** Grades will be based on 3 lecture tests (100 points each), a final cumulative exam (150 points), assignments associated with instructor lead paper discussions (75 points), and presentation (75points) for a total of 600 points

**Graduate Student Grades:** Graduate student requirements will differ from undergraduates in the following ways. Graduate student's presentation (see grades above, 75 points) will be an individual rather than group presentation on a journal article from the primary literature of their choice related to the topics in the syllabus (pending my approval). It is expected that graduate students presenting papers will pursue additional sources of information and be versed on the topic before presentation (i.e., you should be capable of answering detailed questions about the paper following your presentation). In addition to the requirements listed under grades, graduate students will write a mini-review report in the style presented in scientific journals based on readings from the primary literature on a topic focused on mechanisms of cancer. Graduate students should consult with me early in the semester to discuss format and procedure. For graduate students an additional 100 points will be derived from the review article for a total of 700 points.

**Letter Grade assignments:** Grades are calculated on the percentage of the total points earned:  
A: 93-100; A-: 90-92; B+: 87-89; B: 83-86; B-: 80-82; C+: 77-79; C: 70-76; D: 60-69; F: 59 or below

#### **BLACKBOARD:**

Slides used in lecture will be posted on Blackboard prior to/after the lecture. These slides are not a substitute for taking notes. The slides will contain mostly figures, illustrating many of the complex processes we will be discussing during class. I use minimal text on slides and strongly encourage you to take notes to enhance your understanding and learning of the material. Note taking is a skill that requires practice to master, and is essential for learning.

Papers for discussion will be posted on Blackboard a week prior to the discussion.

#### **STUDYING:**

We will cover a large amount of material during this semester. Some of it may be familiar to you, but many topics will be new. There are few techniques you can use to help you to succeed in this course.

**1) Read the book before coming to lecture.** This will allow you to familiarize yourself with the material before it is covered in class and will prepare your mind for learning when you come to class. Also, if you have questions about what you read, you can ask during the lecture. Please, never be afraid to ask a question. Undoubtedly there is someone else in the room wondering the same thing, and it will help everyone if something needs to be explained in a slightly different way, or clarify a point.

**2) Take notes during class.** This is an excellent way to reinforce your learning of the material. Even though

slides will be posted on Blackboard, the material will be discussed in much more detail than is on the slide and you will be responsible for this material on the exam.

**3) Review your notes shortly after lecture**, and ask me again if something is unclear, or fill in missing pieces with information from the text

**4) Quiz yourself.** Use questions at the end of each chapter to test your understanding of the material. These questions are a great way to study.

**5) Most of all, do not procrastinate.** There is no way you can do well on an exam in this course by waiting until the night before the exam to study.

### **OTHER NOTES AND POLICIES:**

**Disability Access and Inclusion:** The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation, or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, timed exams and in-class assignments, difficulty with the acquisition of lecture content, inaccessible web content, and the use of non-captioned or non-transcribed video and audio files. If you are approved through SDS, you must log in to your Rebel Access portal at <https://sds.olemiss.edu> to request approved accommodations. If you are NOT approved through SDS, you must contact Student Disability Services at 662-915-7128 so the office can: 1. determine your eligibility for accommodations, 2. disseminate to your instructors a Faculty Notification Letter, 3. facilitate the removal of barriers, and 4. ensure you have equal access to the same opportunities for success that are available to all students.

**Challenges to Assigned Grades:** Challenges to assigned grades will be welcomed in writing. Challenges must be submitted within one week of a graded assignment.

**Academic Integrity:** Any form of misconduct -- cheating, plagiarism, fabrication -- will not be tolerated and may subject violators to a failing grade in the course. Incompletes will not be given except in extreme circumstances beyond a student's control.

**Withdrawals:** The last date for withdrawal is Monday, March 4.

**Final exam:** Thursday, May 9 8:00 AM

University rules allow a student to change the time of a final exam if that student has three tests on one day. The regulations read: "Any student having three or more examinations scheduled for the same day will arrange with the instructor to take the 12:00 noon examination or the 7:30 p.m. examination on some other mutually satisfactory date."

This syllabus is subject to change at the discretion of the instructor to accommodate instructional, and/or student needs.

**CLASS SCHEDULE:**

<b>Date</b>	<b>Topic</b>	<b>Chapter</b>
Tu Jan 22	Introduction/ Genetics, Cell/Molec Bio review	1
Th Jan 24	The Nature of Cancer	2
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Tu Jan 29	Tumor Viruses	3
Th Jan 31	Cellular Oncogenes	4
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Tu Feb 5	Growth Factors and Their Receptors	5
Th Feb 7	Growth Factors (cont.) - Paper discussion	
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Tu Feb 12	Cytoplasmic Signaling	6
Th Feb 14		
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Tu Feb 19	<b>Exam #1</b>	
Th Feb 21	Tumor Suppressor Genes	7
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Tu Mar 5	pRb and Control of the Cell Cycle	8
Th Mar 7	p53 and Control of Apoptosis	9
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<b>Mar 12/14</b>	<b>SPRING BREAK</b>	
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Tu Mar 19	p53 and Control of Apoptosis - Paper discussion	9
Th Mar 21	Cell Immortalization and Telomeres	10
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<b>Tu Mar 26</b>	<b>Exam #2</b>	
Th Mar 28	Tumor progression	11
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Tu Apr 2	Genome integrity	12
Th Apr 4	Angiogenesis	13
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Tu Apr 9	Invasion and Metastasis - Paper discussion	14
Th Apr 11	Tumor Immunology	15
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<b>Tu Apr 16</b>	<b>Exam #3</b>	
Th Apr 18	The Rational Treatment of Cancer	16
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Tu Apr 23	The Rational Treatment of Cancer	16
Th April 25		
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Tu April 30	Student presentations/discussions	
Th May 1	Student presentations/discussions	
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Th May 9	<b>Final Exam – Thursday May 9 8 AM</b>	