

Spring 2007
BI 149-1Y Course Syllabus

Cancer: Biology and Beyond

Class Meeting Times:
Mondays and Wednesdays 2:00-4:20pm
Fridays 2:00-3:00pm

Instructor:
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Cancer is the second leading cause of death in the United States. In addition to the toll it takes on the body, cancer affects emotional well-being and costs Americans billions of dollars each year in medical fees, as well as lost wages and productivity.

In this course, we will meet three afternoons each week. This time will be used to examine the nature of cancer development, eradication, and prevention in both cells and the body. Guest lectures and field trips will complement the biological perspective and acquaint participants with resources for dealing with the psychological and socioeconomic impact of the disease.

Catalog Description

A study of the development, progression, and treatment of cancer. The fundamentals of cell biology are learned by exploring the differences between normal and cancerous cells. In addition, the psychological and socioeconomic impacts of the disease are studied. This course does not count as an elective unit towards the biology major. Three lectures and one three-hour laboratory per week. Pre-requisites: none.

Course Goals

The goals of this course are for you to learn:

- How healthy cells become cancerous,
- How cancer cells may be eradicated from the body,
- How patients cope with the diagnosis and treatment of cancer,
- And how cancer may be prevented.

Texts for the Course

Weinberg, R.A., 1998 *One Renegade Cell: How Cancer Begins*. Basic Books, New York.

Randall, R.W., and S. Goodwin, 2003 *Biology of Cancer*. Benjamin Cummings, San Francisco.

Assorted additional readings available on-line or on reserve in the library

Course Policies:

Honor Code:

I expect you to follow the Honor Code of the College. You are required to write an appropriate Honor Code on each assignment, quiz, exam, etc. Any violations will be reported to the Honor Council.

Attendance:

Attendance in lecture and lab is required. Attending the lecture will both help you focus your efforts to study the material presented in the readings and will cover material not addressed in the assigned texts. If you miss more than six class meetings for *any* reason (illness, sports trip, etc), then your final grade will be dropped by half a letter (from a B to a B-, for example). Furthermore, when you are late for three lectures, this will count as an absence.

Late Work:

There is a 5% penalty per day for all assignments turned in late.

Make-up Work:

Should you need to miss an exam or a lab (due to severe illness or a family emergency, for example), it is your responsibility to notify the instructor in a timely manner (ideally, at least 48 hours in advance) either in person or by phone. Last minute e-mails are unacceptable! Make-up work will be given at the professor's discretion.

Field Trips:

Several field trips are planned throughout the semester. These field trips are mandatory and in order to participate, you must fill out the release form, which is attached to this syllabus. If you are less than 19 years of age you must have a parent or guardian sign this permission slip and return it to me as soon as possible. For many of these field trips you will be asked to meet the class at a designated location off campus. When this situation arises, it is your responsibility to arrive at the site on time. If you choose to ride with someone else, you are responsible for making sure that the driver is a safe driver, has a valid driver's license, and has liability insurance coverage on his or her vehicle.

Grading:

One fourth of your final grade for this course will come from your *research paper*. This project is designed to allow you to engage in an in-depth study of a cancer-related topic of interest to you. One hundred points of your final grade for this course will be based on your *research paper*. Papers are to be at least 10 pages long (typed, double-spaced, using 12 pt Times New Roman) with a separate cover page. Additional details regarding the paper will be posted on the course Blackboard site. As far as content is concerned, this paper must cross at least two academic fields one of which must be biology. Other fields to tie in to the project might include psychology, political science, theology, or ethics. Potential topics include, but are certainly not limited to:

- The Biology and Psychology of Cancer Pain
- Ethical Implications of Genetic Testing to Evaluate Cancer Risk
- Smoking Bans: Balancing Public Health and Civil Rights
- Descriptions of Cancer in Documents from Ancient Civilizations
- Terminal Cancer and the Ethical Dilemma of Euthanasia
- Funding for Cancer Research: The Intersection of Science and Public Policy

As with all good research papers, you must present the relevant facts, explain more than one point of view on the topic, and synthesize this information as you express your opinion on the matter. As an incentive for you to use the Writing Center, 5 points of extra credit will be offered

to each student who does so one week or more before the paper is due. At the end of the term, you will give a 15 minute PowerPoint *presentation* summarizing your findings. This presentation will be evaluated by both your peers and your instructor.

In addition to presenting your final research project you will also work with a partner to give a brief (15 minute) presentation on one of the five most *common types of cancers* in the United States. Guidelines for this presentation will be explained in class and posted on Blackboard.

Two smaller papers are also required as part of this course. One of these papers will be a *laboratory report* on the results of your Ames Test to determine whether a chemical of interest is mutagenic. The other paper is a transcript of an *interview* you conduct with either a cancer survivor or someone who has lost a loved one to cancer. In addition to turning in the transcript of this interview, you will write a reaction paper based on your experience while conducting the interview. Additional details regarding both these papers will be discussed in class and posted on the course Blackboard site.

Seven percent of your grade will come from weekly *quizzes* given every Friday. These quizzes will be based on both the reading and the lecture material. Although the quiz questions will be significantly easier than those presented on the exams, they will help you focus your studies and identify weak areas. At the end of the semester, your three lowest quiz grades will be dropped. If you miss a quiz, for *any* reason, it cannot be made up, but it may be thrown out as one of your drop grades.

Two *exams* will be administered covering the topics of (1) cancer development, and (2) cancer detection and treatment. Each test will account for 10% of your final grade. In addition, there will be a comprehensive final exam, also worth 20% of your grade.

Finally, 13% of your final grade will come from the *miscellaneous* assignments including grades earned on worksheets accompanying laboratory experiments, project proposals, and outlines.

Grading Breakdown	
Exam 1	100
Exam 2	100
Final Exam	200
Final Project	200
Presentation of Final Project	50
Group Pres. on Specific Cancer	50
Ames Test Lab Report	50
Cancer Survivor Interview	50
Weekly Quizzes	70
Miscellaneous Assignments (worksheets, etc.)	130
Total	1000

LECTURE AND LAB SCHEDULE

The schedule for Lectures and Labs is provided below. Please note that Monday and Wednesday afternoons will often be comprised of a combination of lecture and laboratory activities. *All reading assignments should be completed before arriving to lecture or lab.* This will allow us to have a more meaningful discussion and answer any questions that arose from the reading assignment.

***Please note that this schedule (with the exception of exam dates) is subject to change. You will be notified of any alterations in class, via e-mail, or through the course's Blackboard Announcements page.

THE ORIGINS OF CANCER	
Feb. 7	LECTURE Course Overview READING None
Feb. 9	LECTURE Bad Science and Breast Cancer: Introduction to the Scientific Method Overview of Cells READING “Bad Science and Breast Cancer”
Feb. 12	LECTURE and LAB Exploring Atoms, Molecules, and Chemical Bonds Introduction to Macromolecules: The Stuff Cells are Made of READING Chemical Building Blocks (link to on-line readings available on Blackboard)
Feb. 14	LECTURE and LAB Understanding Macromolecules Isolation of DNA READING DNA (link to on-line readings available on Blackboard) Lab Handout (available on Blackboard)
Feb. 16	LECTURE The Initial Insult -DNA structure and the genetic code -introduction to mutations READING Weinberg Chapter 1 From Gene to Protein (link to on-line readings available on Blackboard)
Feb. 19	LECTURE and LAB The Initial Insult -mutagens Using the Ames Test to Identify Mutagens, Part I READING Weinberg Chapters 2-4 Lab Handout (available on Blackboard)

Feb. 21	<i>LECTURE and LABORATORY</i> Using the Ames Test to Identify Mutagens, Part II Using the Library Effectively <i>READING</i> Weinberg Chapters 2-4 Lab Handout (available on Blackboard)
Feb. 23	<i>LECTURE</i> The Initial Insult, cont'd. -viruses <i>READING</i> Weinberg Chapters 2-4
Feb. 26	<i>LECTURE and LAB</i> Using the Ames Test to Identify Mutagens, Part III Paper-Writing Workshop <i>READING</i> How Cells Communicate (link to on-line readings available on Blackboard) Ames Test Lab Report Guidelines (Available on Blackboard)
Feb. 28	<i>LECTURE and LAB</i> Using the Ames Test to Identify Mutagens, Part IV Tipping the Scales -non-mutagenic carcinogens -the need for multiple mutations -tumor suppressor genes <i>READING</i> Weinberg Chapters 5-8
Mar. 2	<i>LECTURE</i> Inherited Mutations <i>READING</i> Patterns of Inheritance (link to on-line readings available on Blackboard) Chromosomes and Human Genetics (link to on-line readings available on Bb)
Mar. 5	<i>LECTURE and LAB (final project proposal due)</i> To Divide or Not to Divide? -growth factors and signal transduction Molecular Modeling of Ras <i>READING</i> Weinberg Chapters 9-11 Cancer: Cell Division Out of Control (link to on-line readings available on Bb)
Mar. 7	<i>LECTURE and LAB</i> To Divide or Not to Divide? -the cell cycle Mitosis in Normal and Irradiated Cells <i>READING</i> Weinberg Chapters 12-14 Cell Division (link to on-line readings available on Bb) Lab Handout (available on Blackboard)

Mar. 9 **LECTURE**
To Divide or Not to Divide?
-cellular immortality

READING
Weinberg Chapters 12-14

Mar. 12 **LECTURE and LAB**
Obstacles in the Road
-apoptosis
-angiogenesis
-metastasis
Using the Library Effectively

READING
Weinberg Chapters 13-16
How Cancer Spreads (link to on-line readings available on Blackboard)

CANCER DIAGNOSIS

Mar. 14 **LECTURE and LAB** (*Ames Test laboratory report due*)
Techniques for Cancer Detection
-colonoscopy
-histology

READING
Lab Handout and associated readings (available on Blackboard)

Mar. 16 **EXAM 1 (THE ORIGINS OF CANCER)**

Mar. Spring Break--class does not meet
19-23

Mar. 26 **LECTURE and LAB**
Tumor Imaging

READING
How X-rays Work (Link available on course Blackboard page)
How MRI Works (Link available on course Blackboard page)
Advances in Tumor Imaging (link to on-line readings available on Blackboard)

Mar. 28 **LECTURE and LAB**
Techniques for Cancer Detection
-molecular approaches

READING
Advances in Cancer Detection (link to on-line readings available on Blackboard)
Laboratory Handout (available on Blackboard)

Mar. 30 **FIELD TRIP**
UAB Imaging Center

CANCER TREATMENT

Apr. 2 **LECTURE and LAB** (*final project preliminary bibliography due*)
Cancer's Psychological Challenges
Film

READING

Cancer's Psychological Challenges (*Sci. Am.*: pg. 158-161, available on Bb)

Apr. 4 **LECTURE and LAB**
Introduction to Cancer Treatments
-overview: surgery and chemotherapy
Secrets of the Rainforest I

READING

Advancing Current Treatments for Cancer (*Sci. Am.*: pg. 118-123, on Bb)

DNA Technology (link to on-line readings available on Bb)

Apr. 9 **LECTURE and LAB**
More on Chemotherapy
Secrets of the Rainforest II

READING

Fighting Cancer by Attacking Its Blood Supply (*Sci. Am.*: pg. 150-154, on Bb)

New Molecular Targets for Cancer Therapy (*Sci. Am.*: pg. 144-149, on Bb)

Apr. 11 **FIELD TRIP**
Children's Hospital

READING

TBA

Apr. 13 **LABORATORY**
The Problem of Drug Resistance
Individualized Cancer Treatments

READING

Healthcare for You Alone (link to on-line readings available on Bb)

TBA

Apr. 16 **LECTURE and STUDENT PRESENTATIONS**
Immunotherapy
Student Presentations on Common Cancers

READING

Immunotherapy for Cancer (*Scientific American*: pg. 136-143)

How Cancer Vaccines Will Work (Link available on course Blackboard page)

Apr. 18 **FIELD TRIP**
American Cancer Society Hope Lodge

READING

TBA

Apr. 20	LECTURE Cancer Pain: What Causes It and How Can We Treat It?
	READING Nervous and Sensory Systems (Link available on course Blackboard page) Controlling the Pain of Cancer (<i>Scientific American</i> : pg. 164-165, on Bb)
Apr. 23	LECTURE and LAB (final project outline due) Quality of Life Complementary and Alternative Treatments
	READING Alternative Cancer Treatments (<i>Scientific American</i> : pg. 162-163, on Bb)
Apr. 25	FIELD TRIP Hospice
	READING TBA
Apr. 27	EXAM 2 (CANCER DIAGNOSIS AND TREATMENT)
Apr. 30	Work on Independent Projects – class does not meet
CANCER PREVENTION	
May 2	LECTURE and LAB (cancer survivor interview and reaction paper due) Lifestyle Choices -occupational hazards -sun exposure Analysis of Sunscreen
	READING What Causes Cancer (<i>Scientific American</i> : pg. 80-87, on Bb) Strategies for Minimizing Cancer Risk (<i>Scientific American</i> : pg. 88-95, on Bb) Lab Handout (available on Blackboard)
May 4	LECTURE Lifestyle Choices -tobacco products and smoking
	READING TBA
May 7	LECTURE and LAB Lifestyle Choices -cancer vaccines Diet and Nutrition -cancer "causing" foods -cancer "fighting" foods
	READING Nutrition (Link available on course Blackboard page) TBA
May 9	FINAL PROJECT PRESENTATIONS (final project due at 2pm sharp!)
May 15	FINAL EXAM 1:00pm-4:00pm