

BIOL 445 Cancer Biology Spring 2019 T, R 09:30-10:45

Dr. Gidi Shemer

Let's start with what this course is not- it is not a clinical cancer course. It is not aimed to describe the pathology of each and every cancer, and students will not learn how to identify cancer stages by going over histological sections of patients. Instead, this course is devoted to the biology behind cancer, with an emphasis on how the basic science of normal cell and molecular biology can teach us of how regulation goes wrong in cancer cells.

Objectives

1. To describe and to predict the cellular and molecular mechanisms of cancer development
2. To develop higher order learning skills, as demonstrated by the ability to analyze and synthesize ideas to help us comprehend the biological phenomenon of cancer
3. To synthesize biological concepts learnt at earlier stages (e.g. in cellular, molecular, and physiological biology courses)

The course consists of two parts: class meetings led by the instructor, and student projects on a topic/molecule of choice that wasn't covered in the main lectures. We will also use class time to discuss scientific papers from the primary literature that the students will read and prepare for in advance. Assigned papers and other assignments will be posted on Sakai.

Prerequisites

BIOL 202 and BIOL 205

Your Instructor

Dr. Gidi Shemer

Coker Hall 213A

Office hours: Mon 10:00-12:00

Thu 01:00-03:00

Or by appointment

Web page: <http://www.bio.unc.edu/Faculty/Shemer/>

Email: bishemer@email.unc.edu

Your Teaching Assistant

Nicole Arruda narruda@email.unc.edu

Textbook

- **The Biology of Cancer by Robert A. Weinberg, 2nd edition (available in the bookstore)**

Also recommended:

- Natural Obsessions: Striving to Unlock the Deepest Secrets of the Cancer Cell by Natalie Angier
- The Emperor of All Maladies: A Biography of Cancer by Siddhartha Mukherjee

Paper Discussion, GRQs

During the semester, we will discuss primary scientific literature. Before the class discussion you will be asked to read the relevant paper thoroughly and to answer guided reading questions (GRQs), which you will submit as a Sakai assignment in advance.

Class Attendance

Class attendance is mandatory. Absence from class will require permission of the instructor in advance. The discussion is a major part of this course, and personal as well as group activities will take place in class during the semester.

Assignments

Assignments (e.g. readings, blog posting, Molecular biology tools) will be given on a regular basis and will be followed by either written assignments or in-class quizzes. The assignments due dates appear on the class schedule (see below) or will be posted on Sakai during the semester.

Student Projects

In the early stages of the course you will get access to a list of genes that are involved in cancer biology. Your individual project will be to choose a gene from this list, make a comprehensive literature research on the function of this gene in development, physiology and cancer, and to create a poster that will summarize your research. We will have poster symposia (see below) where you will present your research to the entire class. During the semester you will meet twice with a teaching assistant, who will help you and review your first outline and the final poster. **It is your responsibility to schedule those meetings with the TA and to come prepared.** Guidelines on what is required for the poster will be posted on Sakai, and discussed in class.

Poster Symposium

We will have three poster symposia, each composed of two 35 minute sessions. In each session 6 students will present their posters while all other students walk through posters in groups of 5. Every 10 minutes, the audience will rotate. Thus, a presenter will have 3 rounds of presentations of their project. After the presentation, the student will submit to the instructor a power point presentation of the poster (composed of all the figures and text). All the slides will be posted on Sakai so the class will be able to review all the projects. There will be a take-home exam that will cover the poster sessions (see below).

Grading

Your final grade will be determined based on your performance on two midterm exams (26% each), a short home exam (covering the projects, 4%), a cumulative final exam (26%), your research project and presentation (15%), and participation in class discussion, assignments, and quizzes (3%). **The final exam will be cumulative.** It will cover the entire semester.

Grades will not be assigned for individual exams, only points. Final grades will be assigned based on the total number of points for the entire semester:

| | | | | |
|----------|----------|----------|----------|-------|
| A 93-100 | B+ 87-89 | C+ 77-79 | D+ 66-69 | F <60 |
| A- 90-92 | B 83-86 | C 73-76 | D 60-65 | |
| | B- 80-82 | C- 70-72 | | |

The grade will not be curved. It will be based on your performance and not on comparing your performance to your peers'. Exam questions will be taken from class meetings and assigned readings. **Grades will not round up.** B= 83, NOT 82.96. Exams must be taken on the dates indicated during the regular class period; no makeup exams except in special circumstances, i.e. medical or family emergency documented in writing. The makeup test may be an oral exam. I do not drop specific exam grades. All exams count

All course materials including your notes and assignments are covered by University Copyright Policy, @

<http://www.unc.edu/campus/policies/copyright%20policy%2000008319.pdf>

The professor reserves to right to make changes to the syllabus, including project due dates and test dates. These changes will be announced as early as possible.

Schedule

| Date | | | Class | Pre-lecture assignments | Post-lecture assignments |
|----------|--------------|-----------|-------|---|--|
| R | Jan | 10 | 1 | Introduction | |
| T | Jan | 15 | 2 | Viral oncogenes- the story of Src | |
| R | Jan | 17 | 3 | Viral oncogenes- the story of Src II | 1) Pp. 161-164 + GRQ (submit via Assignment-Sakai) 2) Western Blotting (Read Molecular Biology Toolbox) |
| T | Jan | 22 | 4 | Src paper discussion | Src paper + GRQ |
| R | Jan | 24 | 5 | Cellular oncogenes | Southern Blotting (Read Molecular Biology Toolbox) |
| T | Jan | 29 | 6 | The MAPK-Ras pathway | Study the MAP kinase pathway, including pp.188-192 |
| R | Jan | 31 | 7 | Cellular oncogenes- the story of Ras | |
| T | Feb | 5 | 8 | Raf paper discussion | Raf paper + GRQ |
| R | Feb | 7 | 9 | Introduction to the cell cycle | Pp. 275-283 + GRQ (submit via Assignment-Sakai) |
| T | Feb | 12 | | Exam I- Oncogenes (1-8) | |
| R | Feb | 14 | 10 | Control of the cell cycle I | |
| T | Feb | 19 | 11 | Control of the cell cycle II | CKIs blog + fig. 8.17 assignment (due 2/28) |
| R | Feb | 21 | 12 | Retinoblastoma I | |
| T | Feb | 26 | 13 | Retinoblastoma II | |
| R | Feb | 28 | 14 | Ras-Rb paper discussion | Ras-Rb paper + GRQ |
| T | March | 5 | 15 | Catch up | |
| R | March | 7 | | EXAM II- Cell cycle and Rb (9-15) | |
| T | March | 12 | | SPRING BREAK | |
| R | March | 14 | | SPRING BREAK | |
| T | March | 19 | | Student presentation 1 | |
| R | March | 21 | | Student presentation 2 | |
| T | March | 26 | 16 | p53- The Guardian Angel | Immunoprecipitation (Read Molecular Biology Toolbox) |
| R | March | 28 | 17 | Apoptosis | |
| T | April | 2 | 18 | P53 paper discussion | p53 paper + GRQ |
| R | April | 4 | | Student presentation 3 | |
| T | April | 9 | 19 | Metastasis I | 1) Pp. 642-651 2) GFP Tagging (Read Molecular Biology Toolbox) |
| R | April | 11 | 20 | Metastasis II- Interactions with the stroma | Take -home exam Pseudo-science blog (due 4/23) |
| T | April | 16 | 21 | Metastasis III- Interactions with the immune system | Pp. 654-655 |
| R | April | 18 | 22 | Cancer therapy I | |
| T | April | 23 | 23 | Cancer therapy II | CRISPR |
| R | April | 25 | | Cancer therapy- Personalized medicine | |
| F | May | 3 | | FINAL EXAM- 8 am (Cumulative) | |