

Topics in Ecology PCB 4932
Biology of Cancer
Florida International University
Fall 2016

Course Time: Monday and Wednesday 2:00 PM – 3:15 PM
Course Location: Marine Science Bldg 150
Instructor: Helena Schmidt Mayerova, Ph.D.
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Office hours (AC1 383A):

Mon 11:00 AM – 12:00 PM
Tue 2:00 PM – 3:00 PM
Wed 10:30 AM – 1:30 PM
Thur 2:00 - 3:00PM (except for the 2nd Thursday of the month)
or by the appointment

(Please do not come to my office wearing perfume/cologne or any other scented products. If you do I will have to reschedule your appointment)

COURSE DESCRIPTION:

This course will explore fundamental biology of cancer as a dynamic system governed by evolutionary and ecological principles. We will examine the molecular, cellular, and genetic basis of cancer, and cancer etiology with a particular focus on the effects of ecological and physiological disturbances on the emergence of cancer and the effect of resource availability on the cancer spread. Furthermore, we will focus on prevention, diagnosis and treatment exploring how ecological framework may help create theoretical background for novel cancer prevention strategies. We will also discuss social and cultural factors that affect cancer incidence and outcomes.

COURSE GOAL is to acquire fundamental knowledge of cancer biology in context of basic ecological principles and apply this knowledge to recognize the role of particular ecological disturbances on the emergence of cancer. Upon completion of the course, students will be able to:

1. Apply lessons from epidemiology to identify the importance of environmental disturbances in the development of cancer.
2. Identify role of mutations (the outcomes of environmental disturbances) in cancer development, which turn regular species (tissue cells) into invasive species (cancer cells).
3. Define how these mutations deregulate cell signaling networks (nutrient cycling) leading to tumor formation, cancer development and spread (invasion).
4. Explain how cancer (an invasive species acting as ecosystem engineer) creates “cancer swamp” and changes the functions of organs (ecosystems).
5. Discuss cancer prevention, diagnosis, and treatment and explain how ecological framework may help create theoretical background for novel cancer prevention strategies
6. Compare and contrast social factors affecting incidence of cancer and its outcome.

LEARNING MATERIAL:

- 1) Textbook **Robin Hesketh “Introduction to Cancer Biology”**, 1st edition, Cambridge University Press, ISBN: 978-1-107-60148-2 (paperback).
- 2) **“Cancer and the Environment”** publication from US Department of Health, NIH, NCI, and NIEHS (You can download it from blackboard, or from NIH site)
- 3) **Lessons from Applied Ecology: Cancer Control Using an Evolutionary Double Bind**. Cancer Res 2009; vol. 69, p. 7499
- 4) **Turning ecology and evolution against cancer**. Nature 2014, vol. 14, p.371.
- 5) **Ecology meets cancer biology: The cancer swamp promotes the lethal cancer phenotype**. Oncotarget 2015, Vol. 6, p 9669
- 6) **Cancer: an emergent property of disturbed resource-rich environments? Ecology meets personalized medicine**. Evolutionary Applications, Wiley open access article ISSN 1752-4571

We will discuss more articles from peer-reviewed as well as popular journals. I will post recommended readings on Blackboard periodically throughout the semester. You are welcome to bring any article that you find interesting to the class discussions, or post them on blackboard discussion forum. Although the textbook is great source of information, articles will enrich your knowledge and keep you well-informed. Questions from recommended readings and discussion forum posts may appear as test extra credit questions.

We will also use iClickers in the class.

HOW WILL YOU SUCCEED IN THIS COURSE?

Attend: This course comprises significant amount of material and class attendance will help you master the course material. In addition, exams may cover material discussed in the class that are not included in textbook or lecture PowerPoint outlines. In the case of missed lecture days or impending absences, ask your fellow classmates for lecture notes and in-class announcement information.

Prepare and Participate: Be active in the class. Active class participation is very important and even though you might feel nervous to raise your hand and speak, please do so; ask questions, answer questions, trigger discussions, share what you have been reading. Any course material relevant question is appropriate, so do not hesitate to ask. Remember that having an inquisitive mind is vital for science and learning. You will discover that being active in the class will help you to learn. However, in order to be active in the class **you have to come prepared**. If you want to succeed in the class you have to do your work, complete your home assignments and readings before coming to the class. Identify challenging concepts and material and prepare relevant questions for the class. Remember that: *"The will to succeed is important, but what's more important is the will to prepare (Bobby Knight)"*. This apply not only to sport, but to your studies as well.

Communicate: Don't try to solve all class challenges by yourself. Talk.....Talk to your peers, talk to me. Come to my office and share your concerns, request further clarifications of the material, share your thoughts. Let me know if any of the material or class activity is challenging for you and you struggle with it. We will try to find solution together. Don't wait until the end of semester to do so; come early and come as many time as you need. If you can't come during my office hours, please take an appointment. It is important that you start doing this early in the semester in order to overcome obstacles and succeed.

ASSESSMENT:

Your grade will be assessed based on your performance in **three quizzes, the final cumulative exam, assignment, and class activity**. The final cumulative exam is mandatory and will account for 20 % of your final score.

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|----------------------------|-----------------------|---------------------------|
| Grade Distribution: | Quiz 1 | 150 points |
| | Quiz 2 | 150 points |
| | Quiz 3 | 150 points |
| | Final exam | 200 points |
| | Assignment | 200 points |
| | <u>Class activity</u> | <u>150 points</u> |
| | TOTAL | 1000 points (100%) |

Tests and the final exam will consist of multiple-choice, matching, true-false and short answer questions.

Exam dates:

Test 1 – **Wednesday, September 21**

Test 2 – **Wednesday, October 26**

Test 3 – **Monday, November 21**

FINAL EXAM – **Wednesday, December 7, 12:00 PM-2:00 PM.**

If you miss an exam due to the circumstances beyond your control we can set up make-up date with you. However, all make-ups will have an essay format.

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| Grading scale: | A | 93 % - 100% |
| | A- | 90 % - 92.9 % |
| | B+ | 88 % - 89.9 % |
| | B | 83 % - 87.9 % |
| | B- | 80 % - 82.9 % |
| | C+ | 78 % - 79.9 % |
| | C | 70 % - 77.9 % |
| | D | 60 % - 69.9 % |
| | F | <60% |

Assignment: Your assignment will be group presentation. The topics and detail instructions will be posted on Blackboard. You will form groups of 5 during the 2nd week of the semester and select the topic during the third week of September (September 7). You will hand in the names of students in your group during the first class of the 2nd week. Students without group affiliation will be assigned the groups. Afterwards, you will work in groups on the presentations, which will have form of plenary session (instructions will be posted on blackboard). Each group will elect one representative who will submit presentation via Turnitin by **October 17** deadline (I will not accept presentations submitted by e-mail). Each group will present assigned topic to the class according to the outlined schedule (see below). Be aware that you have to present your topic, not read from the notes or PowerPoint slides.

In addition, you will evaluate contribution of each individual member of your group by filling and submitting evaluation Workgroup Peer Review Form. **Each individual group member will submit Workgroup Peer Review Form.** The form will be available on blackboard. You will receive grades from the assignment only after you hand in Workgroup Peer Review Form.

Class Activity: will consist of iClicker questions, short "one-minute paper", and homework assignments. The purpose of iClickers is to follow your progress in the class and provide a feedback immediately. We will also use iClickers for open and anonymous polling to survey class opinions and feedback. The "one-minute paper" will help you to evaluate your own progress in learning immunology concepts. You will have to answer different concept questions within one minute. Your answers will not be graded individually, but your effort to complete them thoroughly will account towards your final grade. The purpose of "one-minute paper" assignments is to complement iClickers in assessing your progress. The major goal of occasional homework assignment will be to reinforce your learning and concept understanding. There will be no make-up for class activity.

Extra Credits: You can earn extra credit by short 5-8 minutes presentation of peer-review article relevant to the course material. The article has to be approved and presented following the class topic schedule. You can select any topic from schedule except those selected for group assignment. You can earn up to 50 points towards the final score.

ACADEMIC MISCONDUCT POLICY:

Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct (e.g. *cheating, plagiarism, academic dishonesty*), they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the *FIU Student Handbook* under the "Academic Misconduct" section."

TENTATIVE ASSIGNMENT SCHEDULE:

(Please be advised that the course syllabus schedule of events is subject to change)

| Week | Subject | Assign readings |
|--|---|--|
| 1 st week August 22 - August 28 | Lessons from epidemiology | Ch1 |
| 2 nd week August 29 - September 4 | Lessons from epidemiology The importance of environmental disturbances in the development of cancer. | Ch1 Ch2 Cancer and the Environment publication from USDH Evolutionary Applications , Wiley open access article ISSN 1752-4571 |
| 3 rd week September 5 -11 (September 5 FIU is closed) | Signaling in normal cells | Ch3 |

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| 4 th week September 12 - 18 | Mutations and cancer development | Ch4 Nature 2014 , vol. 14, p.371 |
| 5 th week September 19 - 25 | Test 1, Wednesday, September 21 What makes cancer cell a cancer cell? | Ch5 Oncotarget 2015 , Vol. 6, p 9669 |
| 6 th week: September 26 – October 2 | Cancer signaling network | Ch6 |
| 7 th week: October 3- 9 | Immunobiology of cancer | Publications posted on Bb Oncotarget 2015 , Vol. 6, p 9669 |
| 8 th week: October 10 - 16 | Cancer prevention, diagnosis, and treatment | Ch7 Cancer Res 2009 ; vol. 69, p. 7499 |
| 9 th week: October 17 - 23 | Cancer and Society: Cancer health disparities | Publications posted on Bb |
| 10 th week: October 24 – 30 | Test 2, Wednesday, October 26 | |
| 11 th week: October 31 - November 6 | <ul style="list-style-type: none"> • Cancer and the environment: Radiation • Cancer and the environment: Chemicals and fine particles in the environment (Student Presentations) | |
| 12 th week: November 7 – 113 | <ul style="list-style-type: none"> • Cancer and the environment: Chemicals in food and water • Infections and cancer (Student Presentations) | |
| 13 th week: November 14 - 20 | <ul style="list-style-type: none"> • Tobacco and cancer • Cancer and the lifestyle: diet, obesity, stress (Student Presentations) | |
| 14 th week: November 21- 27 (November 24-25 FIU is closed) | Test 3, Monday, November 21 | |
| 15 th week: November 28 - December 4 | Future of cancer (class discussion) Review of Cancer Biology | Ch8 |

FINAL EXAM: Wednesday, December 7, 12:00 PM-2:00 PM.