

Course description:

The Cancer Biology Core course will synthesize knowledge of critical aspects in human cancer biology for understanding disease development, multidimensional molecular signatures, diagnostics and therapeutics. This course will draw upon seminal articles on cancer biology concepts, primary research articles and integrate expertise from GSBS faculty to disseminate fundamental knowledge and current progress on basic, translational and clinical cancer research.

| Meeting | Time | Location |
|---------|---|----------|
| Lecture | Monday, 5:00-7:00 PM (First Class, 4:30-7:00) | Virtual |
| Review | Friday, 11:00 AM-12:00 PM | Virtual |

Student responsibilities and expectations:

Students enrolled in this course will be expected to preform following activities each week.

1. Read, process, and review (study) material from 1 or 2 seminal review relating to the week's cancer biology topic
2. Read 2 research articles (e.g. primary research)
3. Write 2 one page literature synopsis for the assigned research articles (see **Course Grading** for more detail)
4. Prepare for and take course quizzes based on course lectures/ readings.
5. Attend and participate at the journal club review session
6. Participate in and contribute to course discussions during lecture, review sessions
7. Prepare for and take a final examination based on lecture and some reading material

Students are expected to complete all assigned reading material (reviews and research literature) prior to class. While you may work and discuss all course materials and assignments in groups, all writing assignments must be your own. Plagiarism and failure properly cite scientific literature and other sources will not be tolerated and are grounds for dismissal from the course and further GSBS disciplinary action. Cheating or engaging in unethical behavior during examinations (quizzes and final) will be grounds for dismissal from the course without credit and further GSBS disciplinary action.

Course Objective:

Upon successful completion of this course, students will have a foundational understanding of the molecular and cellular origins of cancer, as well as historical and current perspectives of cancer research.

Specific Learning Objectives:

- Build knowledge and understanding of cellular and molecular origins of cancer, and foundational drivers and suppressors of tumorigenesis
- Identify seminal signaling pathways and important molecular players in cancer development and progression
- Describe tumor progression and important 'hallmarks' of cancer
- Distill scientific literature into key elements and findings, identify shortcomings and propose future directions.
- Apply the current cancer biology knowledge to propose new hypotheses and experiments to test them.
- Describe standard of care and applications of basic and translational research

Course Grading: A total of 574 points is available during the course. Your grade will be determined by the following items.

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| Literature Synopses (~68%): | For each day of lecture, students will be assigned 2 seminal papers to critically read. Students will write a one page synopsis for each paper and 1) describe key findings, 2) identify any scientific/technological advances and/or short comings in the paper, and 3) suggest 1-2 future studies based on the findings in the paper that are supported by further independent research by the student. The students will have one week to complete each synopses. (390 points possible; 15 per synopses) |
| Final Exam (11%) | Will be comprehensive on materials from the whole of the course (i.e. lectures and review articles). Question formats could include multiple choice, true/false, and short answer (65 points possible) |
| Class Quiz (~11%): | Multiple choice, true/false, short answer quizzes will be assessed at the beginning of each Review session and will be based on content from previous lecture material and reading assignments. (65 points possible; 5 per quiz) |
| Lecture Attendance (~5%): | Students must be physically present for lecture. 85% attendance is require to pass the course (i.e. missing no more than 2 classes). Students are encouraged to ask questions and engage in discussion with classmates and instructors and ask questions during lecture and review sessions. In the case that no oral contributions are made during lecture, written questions or discussion points may be submitted after class and/or brought up during the review session. Participation will be graded on a 0-4 scale and follow defined criteria. (28 points possible, 2 per lecture) |
| Review Attendance (~5%): | All students will have the option of physical or remote attendance for the journal club reviews. Again, 85% is required to pass the course (i.e. missing no more than 2 classes). Students are expected to come prepared to critically discuss and ask questions about one of the scientific articles assigned for their literature synopses (26 points possible; 2 per session) |

COURSE SCHEDULE

| Date | Topic | Instructors | Reading | Homework | Quiz |
|--------|---|---|----------|------------------------------------|--------|
| Jan 11 | Course Introduction and Expectations Cancer pathology, hallmarks, carcinogenesis, and genetics | Jian Hu, PhD Kanishka Sircar , MD Jason Huse, MD, PhD | Review 1 | Literature Set A | |
| Jan 15 | Review Session: Lecture 1 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 1 |
| Jan 18 | Martin Luther King Holiday (no class) | | | | |
| Jan 25 | Oncogenes and tumor viruses | Vicki Huff, MS, PhD Maura L. Gillison, MD/PhD | Review 2 | Literature Set B Synopses A Due | |
| Jan 29 | Review Session: Lecture 2 – | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 2 |

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| Feb 1 | Tumor suppressor genes | George Calin, MD, PhD Sean Post, PhD | Review 3 | Literature Set C Synopsis B Due | |
| Feb 5 | Review Session: Lecture 3 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 3 |
| Feb 8 | Signal transduction programs and cancer metabolism | Haoqiang Ying, PhD Boyi Gan, PhD | Review 4 | Literature Set D Synopsis C Due | |
| Feb 12 | Review Session: Lecture 4 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 4 |
| Feb 15 | Presidents Day Holiday (no class) | | | | |
| Feb 22 | Regulation of the cell cycle and cell growth | Catherine Denicourt, PhD Walter Hittelman, PhD | Review 5 | Literature Set E Synopsis D Due | |
| Feb 26 | Review Session: Lecture 5 - Room G10.3315 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 5 |
| Mar 1 | Genomic instability and DNA repair | Katherina Schlacher, PhD John Tainer, PhD | Review 6 | Literature Set F Synopsis E Due | |
| Mar 5 | Review Session: Lecture 6 - Room G10.3315 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 6 |
| Mar 8 | Apoptosis (p53), autophagy, and necrosis | Ferdinandos Skoulidis, MD, PhD Curtis Pickering, PhD | Review 7 | Literature Set G Synopsis F Due | |
| Mar 12 | Review Session: Lecture 7 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 7 |
| March 15-19 | Spring Break (no class) | | | | |
| Mar 22 | Multi-step tumorigenesis | Nicholas Navin, PhD Andrea Viale, MD | Review 8 | Literature Set H Synopsis G Due | |
| Mar 26 | Review Session: Lecture 8 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 8 |
| Mar 29 | Cell immortalization and tumorigenesis Multi-step tumorigenesis | Ron DePinho, MD | Review 9 | Literature Set I Synopsis H Due | |
| Apr 2 | Review Session: Lecture 9 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 9 |

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| Apr 5 | The cancer microenvironment – hypoxia, inflammation, angiogenesis and stromal-cancer interactions | Cullen Taniguchi, MD, PhD Joseph McCarty, PhD | Review 10 | Literature Set J Synopsis I Due | |
| Apr 9 | Review Session: Lecture 10 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 10 |
| Apr 12 | Invasion and metastasis | Sendurai Mani, PhD | Review 11 | Literature Set K Synopsis J Due | |
| Apr 16 | Review Session: Lecture 11 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 11 |
| Apr 19 | Tumor immunology and immunotherapy | Mike Curran, PhD James Allison, PhD | Review 12 | Literature Set L Synopsis K Due | |
| Apr 23 | Review Session: Lecture 12 | Jian Hu, PhD and Haoqiang Ying, PhD | | | Quiz 12 |
| Apr 26 | Cancer diagnostics – biomarkers * no review session for his literature set | Anirban Maitra, MBBS Ali Azhdarinia, PhD | Review 13 | Literature Set M | |
| Apr 30 | Cancer therapies and predicting response * no review session for his literature set | Robert Bast, BA, MD Timothy A. Yap, MBBS, PhD | Review 14 | Synopsis L, M Due | Quiz 13 |
| May 7 | End of Spring Semester | | | | |
| May 3 - 7 Final Exams | | | | | |
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Course Directors:

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