BIOL-UA 922 Special Topics: Cancer Biology

Instructors:
Carlos Carmona Fontaine
Duncan Smith

Course Description:
In this course, we will study the fundamental mechanisms of cancer emergence & evolution. As you all know, cancer is a devastating disease with huge medical and economical implications. Since the US declared the ‘War on Cancer’ in 1971, the government has spent billions of dollars in research while patients all around the world spend similar sums in medical bills. After all these investments, we have made significant discoveries and therapeutic improvements but we still lack a definitive cure for cancer. In this course we will cover some of the most important advances in cancer research, with a special emphasis on why basic research is critical to address the challenges posed by this disease. We hope to give you a solid foundation on the fundamental molecular and cellular mechanisms behind tumor initiation, progression, and spreading. We will also cover how tumors evolve and how this evolutionary process is largely responsible for the difficulties in eradicating cancer. At the end of the course, we will discuss how basic research has enabled novel therapeutic approaches that are bringing us a step closer to cure cancer.

Pre-requisites:
Molecular and Cell Biology I (BIOL-UA 21)
Molecular and Cell Biology II (BIOL-UA 22)

Textbook and Required Materials:
The Biology of Cancer. Robert Weinberg

Grading:
Discussant report/participation during other paper discussions 30%
Midterm 30%
Final exam 40%

Topics:
What is Cancer?
DNA damage and mutagenesis
DNA repair
Oncogenes and tumor suppressor genes
Apoptosis and growth factor independence
Cell immortality
Tumor metabolism and oncometabolites
Cancer as a multicellular ecosystem
Spatial heterogeneity within tumors
Temporal evolution and natural selection in cancer
Chemotherapy
Immunotherapy and personalized medicine