

## **Cancer Related Courses**

Some courses are offered in the fall semester and some in the spring. CWRU offers the courses in a staggered fashion so that they are taught in different semesters and time slots to maximize the opportunities for graduate students and postdoctoral fellows to take multiple cancer-related courses. There are two exceptions to these general rules. The C3MB course is given every fall to incoming graduate students and any other interested MD postdoctoral fellows. The Bioethics course (On Being a Professional Scientist) is given every spring and is required for graduate students and postdoctoral fellows.

### **BIOC 408 - Genes and Genetic Engineering (4)**

**David Samols, PhD**

An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and RNA processing and modification. Eukaryotic and prokaryotic systems are compared. Special topics: yeast as a model organism, molecular biology of cancer, and molecular biology of development. Discussion of current literature as introduction to techniques of genetic engineering.

### **BIOC 420 - Molecular Genetics of Cancer (3)**

**Edward Stavnezer, PhD\***

This course provides an in-depth analysis of cancer as a genetic disease in the Mendelian sense of inheritance and in the sense of causation by somatic mutation. Objectives of this course are to examine both the proto-oncogenes and tumor suppressor genes that are the target of oncogenic mutations and the mechanisms of mutational change. Discussions emphasize experimental approaches used to identify and study oncogenes and tumor suppressor genes. Course also covers viral mechanisms of oncogenesis that involve interactions between viral proteins and the products of cellular proto-oncogenes or tumor suppressor genes.

### **BIOC 618 - The Biology and Mathematics of Biochemistry Micro-array Studies (2)**

**Patrick Leahy, PhD**

This is a hands-on computer-based course, will enable participants to conduct meaningful analyses of microarray data. Participants will gain a thorough understanding of the principles underlying available micro-array technologies, including: theory of sample preparation, sample processing on microarrays, familiarity with the use of Affymetrix MAS (Microarray Suite) software including algorithms, generation of micorarray data sets, an ability to move and globally manipulate and pre package data. The students will gain an understanding of the theory and practice of clustering. Data from cancer cells are compared to normal cells, and compared to cancer cells following therapeutic doses of anticancer agents. Participants will become knowledgeable about the rationale behind the choice of normalization and data filtering strategies, distance metrics, and use of appropriate clustering choices.

**CBIO 453/455 – Cellular and Molecular Biology (8)****Martin Snider, PhD**

Topics include: the replication of DNA, transcription of RNA and its regulation, mechanism of protein synthesis, and the regulation of gene expression in growth and development. Genetics, from classical genetics to genomics. Cell biology--an introduction to cellular organelles and structures in both eukaryotic and prokaryotic cells.

**EPBI 497 - Epidemiologic Studies of Cancer Etiology and Prevention (3) \_\_\_\_\_**

Provides descriptive epidemiology of most major types of cancer. Examines current knowledge of the role that host factor, lifestyle, chemicals, radiation, viruses, familial factors and benign diseases play in the etiology of various cancers, as determined from studies of human populations. Applications of epidemiologic principles to programs of primary, and secondary cancer prevention. Prerequisite: EPBI 490

**EPBI 498 - Cancer Epidemiologic Analyses of National Data (3) \_\_\_\_\_**

Practical experience in analysis of cancer data including: defining a hypothesis, conducting a literature search, designing appropriate analyses, analyzing the data, and reporting the findings. Students analyze cancer data sets currently on file, such as National Cancer Institute's Surveillance, Epidemiology, and End Results.

**EVHS 401B – Exposure of Environmental Toxins (1.5)                      Martina L. Veigl, PhD**

The toxicity, mutagenicity, carcinogenicity, and teratogenicity of environmental agents and the potential for human exposure to these agents through environmental, occupational and medicinal routes are discussed.

**EVHS 402A - Fundamentals of Environmental (1.5)                      Martina L. Veigl, PhD**

An overview of the scientific approaches used to determine whether environmental agents are potentially dangerous to people. Criteria utilized for establishing exposure limits are presented and short-term assays, epidemiology studies and clinical trials are used to assess the impact of environmental exposure on normal and genetically susceptible individuals.

**EVHS 403A - Radiation Biology (1.5)    John F. Greskovich, MD**

Major emphasis on cellular and molecular radiation biology. Includes discussion of the physics and chemistry of radiation, factors that modify the cellular response to radiation, molecular and genetic effects of radiation on cells, individual and populations; analysis of risks vs. benefits of diagnostic and therapeutic radiation, the molecular biology of radiation response.

**EVHS 502 - DNA Damage and Repair (3)****David W. Sedwick, PhD\***  
**Martina L. Veigl, PhD**

In-depth consideration of agents that alter DNA directly or indirectly through effects on its synthesis and examine the mechanisms and repair processes through which cells respond to this damage. Topics include fidelity of DNA replication, excision repair, mismatch repair, transcription-linked repair, SOS repair and recombinational repair. Other DNA damage responses controlling decision points between DNA repair and apoptosis considered. Agent-specific DNA damage, such as that caused by agents leading to bulky adducts, AP sites, base-base mismatches and damage to DNA bases are considered in the context of specific repair processes responding to these DNA insults in prokaryotes and eukaryotes.

**GENE 521 - Chromatin Structure & Transcription (3)****Peter J. Harte, PhD**  
**Edward Stavnezer, PhD\***

A critical review of selected topics and current literature on the role of chromatin structure in the regulation of gene expression.

**IBMS 500 – On Being a Professional Scientist (0)****Eric T. Juengst, PhD**

This course provides graduate students with an opportunity to think through their professional ethical commitments before they are tested, on the basis of the scientific community's accumulated experience with the issues. Students will learn the current state of professional policy and federal regulation in this area, and, through case studies, will discuss practical strategies for preventing and resolving ethical problems in their own work.

**MBIO 518 - Signaling via Cell Adhesion (3)****Susann M. Brady-Kalnay, PhD\***

This course emphasizes current advances in cell-cell and cell-substrate interactions including molecular mechanisms by which cells interact with and are regulated by extracellular matrices and other cells. There is an emphasis on aberrant adhesion in cancer.

**PATH 425 - Stem Cell Biology and Therapeutics Course (3)****Kevin Bunting, PhD**

This course provides a broad overview of various fetal and adult stem cells and their potential application in regenerative medicine. At the heart of regenerative medicine in cancer is the continually evolving practice of stem cell transplantation. New uses of stem cells as delivery vehicles for cancer treatment and gene therapy for cancer are also being developed and moving toward clinical trials. For example, genetic modification of the stem cells in patients receiving stem cell transplants can be used to protect the bone marrow from the dose-limiting toxicity of DNA damaging agents, allowing dose-escalation. Mesenchymal stem cells [MSC] are being used to suppress graft-vs.-host disease and promote hematopoietic stem cell engraftment in cancer patients. An additional ability of MSCs to track to tumors provides a unique mode of tumor-targeted therapy.

**PHRM 520 - Cancer Biology and Therapeutics (3)****David Danielpour, PhD\***

This course is an introduction to the genetics, prevention, and treatment of cancers. This course covers: DNA damage and repair; cancer genetics; chemical carcinogenesis and prevention; signal transduction; cell cycle checkpoint regulation; hormonal regulation; chemotherapy and apoptosis. Also includes an examination of the pathology of cancer and cancer epidemiology and biostatistics, in addition to the cellular and molecular biology of cancer.

**PHRM 434 - Mechanisms of Drug Resistance (3)****Eric J. Arts, PhD**

This course focuses on and compares the drug resistant mechanisms selected by viruses, bacteria, parasites, fungi, and tumor cells. Topics include antiretroviral resistance (e.g., AZT and protease inhibitors), antibiotic resistance (e.g., Bactams), resistance to chemotherapeutic agents, and resistance to anti-malarial drugs (e.g., chloroquinone). Experts in the field at both CWRU and from other institutions across the US provide the comprehensive lectures. The journal, Drug Resistance Updates is provided as a support text.