

Toxicology and Cancer Biology

College of Medicine

The Department of Toxicology and Cancer Biology is a multidisciplinary unit for research and graduate education in the broad areas of toxicology and cancer biology. Our mission is to provide students with an education in toxicology and cancer biology that is based on an understanding of biochemistry, physiology, molecular biology, cell biology, genetics and systems biology. This is coupled with in-depth research experience on the mechanisms by which environmental agents cause disease, with primary emphases in the areas of cancer, cardiovascular disease, and neurodegeneration. The roles of redox signaling, DNA repair and metabolism are areas of focus. Our department consists of 19 tenured/tenure track core faculty with a primary appointment in The Department of Toxicology and Cancer Biology. The diversity of training opportunities is enhanced by a large number of faculty who have joint appointments in the department, but whose primary appointments are in departments and colleges across the University of Kentucky including Agriculture, Biochemistry, Chemistry, Nutritional Sciences, Pathology, Pharmacy, Pharmacology, Radiation Medicine, and Veterinary Medicine. The Department of Toxicology and Cancer Biology has graduated more than 170 PhDs who have gone on to careers in academia as faculty members at major research universities, government agencies, such as the Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA), and in the pharmaceutical and chemical industries. The department maintains a robust extramurally supported training environment, including an NIEHS T32 training grant for doctoral students in Toxicology and Cancer Biology, which has been continuously funded since 1990.

The department is housed in the Health Sciences Research Building in the Medical Center within easy walking distance of all major research units and colleges. Excellent research support facilities are available, including transgenic mouse, macromolecular structure, mass spectrometry, nuclear magnetic resonance, proteomics, genomics, and metabolomics.

Admission Requirements

Applicants must meet the following requirements for admission to the University of Kentucky Graduate School and the Toxicology and Cancer Biology program.

1. An appropriate degree (e.g., Chemistry, Biological Sciences) from an accredited college or university.
2. A minimum grade point average of 3.0 on a 4.0 scale.
3. An average Graduate Record Examination (GRE) score on the verbal, quantitative and analytical sections that is great than 50th percentile.
4. For international applicants, the minimum acceptable TOFEL score is 550 (paper-based), 213 (computer-based), or 79 (internet-based). The minimum IELTS score is 6.5.

Applicants with lesser qualifications will be accepted only if other indices of performance and qualification are outstanding.

Course Descriptions

TOX 508 RESEARCH METHODS IN TOXICOLOGY. (1-3)

The course provides students with 'hands on' experience in research methods used to solve toxicological problems. Students will be under the direction of a GCT faculty member, who will supervise the student's efforts on a research project. The student will be trained not only in the 'hands on' techniques but also in how to independently design and interpret research experiments. Students will prepare a final report on their research project, which will be designed to provide instruction and training in preparing 'publication-

style' research reports. This course is distinct from 'topical seminar' or 'library survey' courses, since such courses are not 'hands on' in experimental methods. May be repeated to a maximum of six credits. Laboratory, two-six hours per week. Prereq: Status as upperclass undergraduate, post bac, or graduate student.

TOX 509 ENVIRONMENTAL AND REGULATORY TOXICOLOGY. (2)

Presentation of basic and advanced concepts to provide an integrated description of toxicology, its scope, the unique application of principles that characterize it as a science, and its professional practice. Emphases will include an extensive treatment of relationships between toxicology and environmental exposures and the influence of federal regulations on the practice of toxicology. Prereq: BCH 501 or BCH 401G or other equivalent or consent of instructor.

TOX 560 ECOTOXICOLOGY. (4)

Emphasis will be placed on the physiological and toxicological effects of chemicals on natural biota, including considerations at cellular, organismal, population, and community levels. This will include assimilation and metabolism of pollutants by animal species, with emphasis upon biochemical and physiological mechanisms involved in stress-induced responses and stress reduction. Additional areas of concern will include the transport, fate, and effects of chemical stressors on structure and function of biotic communities and will include introductions to ecotoxicology and environmental regulatory strategies. Prereq: CHE 105, CHE 107, BIO 150, BIO 153 and BIO 315 or BIO 350 or PGY 502 or equivalents or consent of instructor. (Same as PLS 560.)

TOX 600 ETHICS IN SCIENTIFIC RESEARCH. (1-2)

The course will commence with an overview of good laboratory practices and present them as the basis of good scientific research, along with an overview of quality assurance and appropriate practices in data analysis and data interpretation. The course will then move to the ethics of human and animal experimentation and discuss the concepts of data and intellectual property, their ownership and access to them. The problems of reviewing other workers' intellectual property such as grant applications, research papers and other intellectual property will be addressed. Prereq: Research experiences; consent of instructor. (Same as VS 600.)

TOX 649 ADVANCED MOLECULAR PHARMACOLOGY. (2)

This course will provide in-depth coverage of the molecular pharmacology of growth factors, transcription factors, receptors, and ion channels. Emphasis will be placed on both the normal functions of these cell-signaling molecules and perturbations that result in several prevalent human diseases, including cancer, Alzheimer's, diabetes, osteoporosis, and inherited human illnesses. Students will be introduced to experimental approaches to diagnosing and treating these illnesses in the light of our evolving knowledge of molecular pharmacology. Prereq: IBS 601-606 or consent of instructor. (Same as PHA/PHR 649.)

TOX 680 MOLECULAR TOXICOLOGY AND CARCINOGENESIS. (3)

An intensive examination of 1) the key molecular and cellular mechanisms related to toxicity and carcinogenesis, and 2) the established relationships between exposures to toxicants and development of cancer and other human diseases. Prereq: TOX 509, TOX 663 or consent of Director of Graduate Studies.

TOX 690 PRACTICAL ANALYTICAL TOXICOLOGY. (3)

An evaluation of techniques for the isolation, identification, and quantitation of drugs, pesticides and other toxicants in biological samples. Concepts and theory will be presented in the lecture portion, while the laboratory will be devoted to actual sample analysis by the students. Lecture, 1 hour; laboratory, six hours. Prereq: Consent of the instructor and graduate standing in toxicology. (Same as VS 690.)

TOX 748 MASTER'S THESIS RESEARCH. (0)

Half-time to full-time work on thesis. May be repeated to a maximum of six semesters. Prereq: All course work toward the degree must be completed.

TOX 749 DISSERTATION RESEARCH. (0)

Half-time to full-time work on dissertation. May be repeated to a maximum of six semesters. Prereq: Registration for two full-time semesters of 769 residence credit following the successful completion of the qualifying exams.

TOX 767 DISSERTATION RESIDENCY CREDIT. (2)

Residency credit for dissertation research after the qualifying examination. Students may register for this course in the semester of the qualifying examination. A minimum of two semesters are required as well as continuous enrollment (Fall and Spring) until the dissertation is completed and defended.

TOX 780 SPECIAL PROBLEMS IN TOXICOLOGY. (2)

Exposure to and actual research experience in an area of toxicology other than that encountered by students in their thesis and dissertation research. May be repeated to a maximum of six credits. Prereq: Consent of graduate adviser.

TOX 790 RESEARCH IN TOXICOLOGY AND CANCER BIOLOGY. (1-6)

Research in Toxicology and Cancer Biology. Research will be conducted in specific areas of toxicology and cancer biology. Learning Outcomes: 1. Conduct independent, hypothesis driven research; 2. Demonstrate the ability to read, understand and apply the scientific literature that is relevant to the research activities; 3. Demonstrate the ability to develop original hypotheses, develop strategies and design experiments to test hypotheses; 4. Demonstrate competency in the collection, analysis and interpretation of data that is relevant to the research activities. Prereq: Consent of Director of Graduate Studies