



Environmental Toxicology

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College of Sciences

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FACULTY

Professors:

Owens, John

Ph.D., *University of New Orleans*

Atkins-Ball, Deidra

Ph.D., *Meharry Medical College*

Miller, Robert

Ph.D., *Ohio University*

Johnson, Clyde

Ph.D., *West Virginia University*

Onu, Chukwu

Ph.D., *West Virginia University*

Gray, Wesley

Ph.D., *University of Maryland*

Associate Professors:

D'Auvergne, Oswald

Ph.D., *Immunology, University of Michigan, 1993*

Claville, Michelle

Ph.D., *Chemistry, University of Florida, 1998*

Assistant Professors:

Martinez-Ceballos, Eduardo

Ph.D., *Cell and Molecular Biology, Tulane University, 2001*

Adjunct Professors:

Raghavamenon, Achuthan

Ph.D., *MG University, Kottayam, India, 2000*

Bobba, Rambabu

Ph.D., *Andhra University, India, 1986*

Kumar, Challa

Ph.D., *Chemistry, Sri Sathya Sai University, India (LSU)*

Kousoulas, Konstatin (LSU)

Ph.D., *Biotechnology, Fairleigh Dickinson University*

Introduction

The Environmental Toxicology Program offers a Doctor of Philosophy degree in environmental toxicology. Four study options are offered, one of which may be chosen by the student with approval of the graduate committee of the Department of Environmental Toxicology. These options include:

1. Molecular Reproductive Toxicology and Cell Biology
2. Toxicological Effects of Priority Toxic Chemicals
3. Chemical Detection and Evaluation of Toxicological Substances in the Environment
4. Microbial Treatment and Detection of Hazardous Materials and Environment Contaminants

The Ph.D. in Environmental Toxicology is one of the newest doctoral programs at Southern University, Baton Rouge. Therefore, it is possible that changes in the program, including course listings and option areas, as described herein may be made as this program evolves. Students will be notified of all changes in a timely manner. Please visit our website at <http://www.subr.edu/entox>.

Mission Statement

The Ph.D. Program in Environmental Toxicology strives to train qualified individuals to conduct basic and applied research on the potentially adverse effects of chemicals and complex mixtures of environmental contaminants on biological systems and the environment, to conduct basic and applied research on the molecular mechanisms of chemically induced toxicity, to advance environmental toxicology as a science, to communicate the concepts and findings of toxicological research and evaluations, and to serve as an information resource on toxicological matters to the state and the general public.

GRADUATE DEGREES OFFERED

Ph.D. Doctor of Philosophy in Environmental Toxicology

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MINIMUM ADMISSION REQUIREMENTS

An earned and relevant graduate or undergraduate degree from an accredited university.

A graduate grade point average (GPA) of 3.0/4.0 and an undergraduate grade point average (GPA) of 3.0/4.0. Students with otherwise exceptional qualifications who do not meet the minimum GPA may be evaluated on an individual basis.

Undergraduate or graduate course credit of at least three semester hours from an accredited university in each of the following: cell biology, genetics, biochemistry and organic chemistry. Students who have not completed these prerequisite courses may be admitted to the program on a conditional basis but will not receive full admission status until these courses have been completed.

A Graduate Record Examination score of 1000 or better (verbal and quantitative). Students with exceptional GPAs from their respective institutions who do not meet the minimum GRE requirement may be evaluated on an individual basis.

A 600-word essay on the student's career goals and interest in the toxicology program.

Three letters of reference including at least two letters from former instructors.

Recommendation by the program student admissions committee.

GRADUATION REQUIREMENTS

For students entering the program, the minimum coursework requirement is 36 hours, typically comprised of 21 hours of core courses, 9 hours of toxicology electives and 6 hours of general electives, exclusive of the thesis, doctoral dissertation and research. Upon completion of the core courses, students must take and satisfactorily pass all sections or the qualifying examination to become candidates for the Ph.D. degree. After passing the qualifying examination, and with approval of the student's advisory committee, students may register for dissertation research credit hours.

Students who receive more than two grades of C or below shall be automatically dismissed from the program.

This outline of minimum requirements may be expanded as the student prepares a study plan. Each student must develop, with advisors, an approved plan of study no later than the second semester in residence. To remain in good standing, each student's GPA must remain at 3.0 or better.

POLICY AND GUIDELINES FOR ASSISTANTSHIPS/SCHOLARSHIPS

A limited number of assistantships are available for full-time students with regular status who take at least nine credit hours per Fall and Spring semester and provide research assistance to designated faculty members as assigned. Graduate assistants must maintain a minimum 3.0 GPA. Based on cumulative scores, awards shall be determined by committee beginning with the highest score until the money allocated is depleted.

Graduate assistants dropping to less than nine credit hours for the Fall and Spring semesters or less than six credit hours during the summer term shall have their assistantships revoked. Students with less than a 3.0 GPA shall not be eligible for further assistantship until the GPA requirement is met. Students who have experienced financial assistantship revocation must wait one semester before applying for renewed financial assistance.

Because the Ph.D. Program is a desegregation program mandating diversity, special consideration shall be extended to other race students in assistantships, tuition waivers and tuition scholarships. For more information, please visit our website at <http://www.subr.edu/entox>.

General Tuition Waivers/Scholarships

Students who enroll full-time but have no assistantship shall be considered for tuition scholarship subject to the following conditions:

Funds must be available.

The student must be enrolled full-time and must carry a full-time load (nine or more credit hours) to the end of the semester/term.

The student must not be employed full time and must not earn a reasonable income (reasonable income determined by committee).

GRADUATE ADVISORY COMMITTEE

Students should assemble their graduate degree advisory committee as soon as possible after the first semester of

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study, but no later than one year from entering the program. The graduate advisory committee for a student shall consist of no fewer than four members selected from the graduate faculty. At least two members, including the chairperson, will be from the department recommending the degree, and at least one member may be drawn from a different educational discipline. The committee should be appointed as soon as possible after the student has completed the core curriculum.

COURSE OF STUDY

Core Courses (twenty-two hours are required)***

ENTX 700	Bioethics	3 credits
ENTX 710	Environmental Toxicology Seminar	1 credit*
ENTX 721	Principles of Environmental Toxicology I	3 credits
ENTX 722	Principles of Environmental Toxicology II	3 credits
ENTX 723	Advanced Biochemistry I	3 credits
ENTX 725	Biochemical and Molecular Toxicology	3 credits
EENTX 731	Animal Physiology	3 credits
ENTX 737	Biochemical Methods	3 credits**

*** must be taken once, may be repeated up to four times**

**** 3 credits are required may be repeated up to 6 credits**

***** B or better in required for all core courses**

Toxicology Electives (nine hours are required)

ENTX 724	Advanced Biochemistry II	3 credits
ENTX 732	Aquatic Toxicology	3 credits
ENTX 733	Cell Physiology	3 credits
ENTX 736	Special Topics in Toxicology	3 credits
ENTX 740	Environmental Microbiology	3 credits
CHEM 560	Toxic Substances, Effects, and Controls	3 credits
PPOL 750	Environmental Regulations and Law	3 credits
ENTX 750	Organ System Toxicology	3 credits
ENTX 757	Bioinformatics	3 credits

General Electives* (six hours are required)

BIOL 506	Biostatistics: Experimental Design and Analysis	3 credits
OR		
SMED 739	Applied Statistics	3 credits
ENTX 743	Methods in Bioremediation	3 credits
ENTX 744	Risk Assessment	3 credits
ENTX 745	Molecular Epidemiology	3 credits
ENTX 751	Reproductive Physiology	3 credits
ENTX 752	Advanced Human Nitrition	3 credits
ENTX 753	Recent Advances in Virology	3 credits
ENTX 754	Parasitology	3 credits

ENTX 755	Molecular Immunology	3 credits
ENTX 771	Plant Physiology	3 credits

**These courses could be selected from existing courses in other Ph.D. programs, other master's programs, including Chemistry, Biology, Nursing, Urban Forestry, or Public Policy.*

Research Courses

ENTX 799	Environmental Toxicology Practicum	3-6 credits***
ENTX 800	Dissertation Research	3-9 credits***

*****may be repeated for a maximum of fifteen hours each.**

A MINIMUM TOTAL OF THIRTY-SIX HOURS ARE REQUIRED TO COMPLETE THE CURRICULUM

COURSE DESCRIPTIONS

Core Courses

ENTX 700 BIOETHICS (Credit, 3 hours). Topics include the bioethical considerations and concerns that confront the conduct of research and its perceptions by the public. Special attention is given to the ethics of environmentally related research, journalism, human experimentation, genetic research, professional role responsibility, and conflicts of interests. The course also covers institutional review board policies as written by the National Institutes of Health. The course will be taught from a multi-disciplinary approach to provide opportunities for the full participation of students.

ENTX 710 ENVIRONMENTAL TOXICOLOGY SEMINAR

(Credit, 1 hour). This course must be taken once, but may be repeated for a maximum of 4 hours degree credit. Requirements include reports by students, resident faculty and distinguished visiting faculty on topics of current interest in Environmental Toxicology.

ENTX 721-722 PRINCIPLES OF ENVIRONMENTAL TOXICOLOGY I & II (Credit, 3 hours each).

Introduction to the basic principles of environmental toxicology; applications of these principles in industrial and other job related environments; regulatory perspectives; spills; anthropogenic pollution problems; human risk management; overview of classes of toxic agents, routes of exposure, target tissues (human and other mammalian species); testing and screening agents for genotoxic activities; molecular genetic approaches to environmental biomonitoring.

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ENTX 723 ADVANCED BIOCHEMISTRY I (Credit, 3 hours).

An advanced biochemistry course concerned with major metabolic pathways and their control. The metabolism of carbohydrates, proteins, lipids, and nucleic acids is discussed. Bioenergetics is also featured and details the production and utilization of energy by the cell. Other topics include metabolic diseases with emphasis on molecular control, response to toxins, and adaptation of cells to pollutants.

ENTX 725 BIOCHEMICAL AND MOLECULAR TOXICOLOGY (Credit, 3 hours).

The effects of chemicals on biochemical pathways, target organelles (e.g., mitochondria, lysosomes), and specific enzymes are the central theme of the course. Selected topics include, phase I and II xenobiotic metabolism, generation of reactive intermediates of chemicals, genotoxicology and principles of chemical carcinogenesis.

ENTX 731 ANIMAL PHYSIOLOGY (Credit, 3 hours).

A comprehensive and integrated course designed to cover the principles and fundamental concepts associated with the functional activities and mechanisms of action involved with the coordination and maintenance of homeostasis, bioenergetics, biocatalysis and metabolic processes. Clinical and toxicological relationships will also be evaluated.

ENTX 737 BIOCHEMICAL METHODS (Credit, 3 hours).

Must be repeated for a maximum of 4 hours degree credit. This is a laboratory rotation course where students are exposed to current methodology in the environmental and biochemical sciences. This course will involve theoretical and practical applications of quantitative and qualitative measurement in biological systems. Students enrolled in this course will do nine-week rotations in selected research laboratories and give an oral presentation on methods learned during the rotation.

Toxicology Electives

ENTX 724 ADVANCED BIOCHEMISTRY II (Credit, 3 hours).

Topics include nucleic acids and proteins (biochemistry of nucleic acids, structure, expression and regulation of genes, structure, base sequence, hybridization, enzymology of replication of DNA and RNA), biosyntheses of proteins, polyribosomes, structure and function relationship, structure of proteins and enzymes, and primary, secondary and tertiary structure. Principles involving the action of enzymes on the molecular level, including kinetics, inhibition, pH effects, active sites, co-enzymes, and reaction mechanisms are also studied.

ENTX 732 AQUATIC TOXICOLOGY (Credit, 3 hours).

This course features a study of the effects of environmental contaminants on aquatic and marine organisms. The relationships between impact on individual organisms, populations, communities and ecosystems, relative effects of chemicals on larvae and embryo development, biomarkers of pollutant exposure for early-warning detection of deleterious effects of chemicals, bioaccumulation and bioavailability of effluents, sediment and other particulate adsorption models, ecological risk assessment for aquatic toxicants and comparative biochemical mechanisms, including metabolism, adaptation and toxicity.

ENTX 733 CELL PHYSIOLOGY (Credit, 3 hours).

A study of the fundamental cellular functions with emphasis on molecular and biochemical principles, enzyme catalysis, metabolic pathways, the flow of information and energy, and energy transformation and mobilization.

ENTX 736 SPECIAL TOPICS IN TOXICOLOGY (Credit, 1-3 hours).

May be repeated for a maximum of 9 hours degree credit. This course will cover current topics pertaining to Environmental Toxicology. Issues relating to method development and application, toxin and analysis, disease prevention, environmental issues and new environmental law are possible topics.

ENTX 740 ENVIRONMENTAL MICROBIOLOGY (Credit, 3 hours).

This course will involve an advanced study of the practices of biodegradation and bioremediation with emphasis on microbial ecology. Specific topics include the basic concepts of entrophication, indicator organisms, soil and aquatic microorganisms, and assessment of biological treatment practices in water reuse and/or purification.

ENTX 741 AIR POLLUTANTS AND HEALTH (Credit, 3 hours).

The science and technology of air pollution and its control, effects of air pollutants on plant and animal life and on inanimate objects and materials, and methods of detecting and measuring air pollutants and their effects on the environment.

ENTX 742 ENVIRONMENTAL REGULATIONS (Credit, 3 hours).

The course includes discussion of various regulations that govern the manufacture and distribution of a wide variety of chemicals. Special emphasis is placed on toxic chemicals, as defined by the Clean Water Act, Clean Air Act, Toxic Substance Control Act (TSCA), Resource Conservation Recovery Act (RCRA), Comprehensive Environmental Re-

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sponse, Compensation, and Liability Act (CERCLA), Occupational Safety and Health Administration (OSHA), the and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Other non-regulatory agencies are discussed, including the National Institute of Occupational Safety and Health (NIOSH), the National Cancer Institute (NCI), and the National Toxicology Programs (NTP). Federal guidelines for the control of fugitive emissions, incinerators, boilers, and stacks are also discussed.

ENTX 750 ORGAN SYSTEMS TOXICOLOGY (Credit, 3 hours). The course features topics related to the effects of chemical toxicants and toxins on the various major organ systems of mammalian and other vertebrate models. Topics include systematic study of the toxicity of chemicals on hepatic, neural, endocrine, renal, circulatory, and immune systems. A central theme is the nature of the organ systems and its relationship to organ-specific toxicity of chemicals.

ENTX 757 Bioinformatics (Credit, 3 hours). This is an introductory web-based course that focuses on the assessment of Bioinformatics in Environmental Toxicology. Principles, techniques, and applications in the fields of genetic engineering, sequence alignment, substitution methods, phylogenetics, genomics, and gene recognition, are emphasized. The course also offers on-hand experience with subject-related computer programs and algorithms.

General Electives

The listed and additional general electives that are consistent with the student's program of study may be taken with the approval of the student's advisory committee. General electives are designed to enrich the individual student's graduate degree program.

ENTX 726 ADVANCED BIOSTATISTICS (Credit, 3 hours). This course is designed to acquaint advanced toxicology students with research designs for biological experimentation. Emphasis is on parametric and nonparametric statistical analysis and their applicability to more advanced experiments.

ENTX 743 METHODS IN BIOREMEDIATION (Credit, 3 hours). This course focuses on the harvest and metabolic pathways of select microbial organisms for use in the direct ingestion and chemical conversion of toxic substances into other innocuous chemicals. The identification of microbes for the singular clean up of toxic chemical spills (oils, gas, and other non-petroleum toxic chemicals) is discussed.

ENTX 744 RISK ASSESSMENT (Credit, 3 hours). This course focuses on the risk of hazardous chemicals to plants and animals. Methods of identification for hazardous chemicals are discussed, as well as the possible adverse health effects associated with these chemicals. The course also focuses on chemical dose response in humans, chemical exposure assessment in various environmental conditions, and the characterization of risk to a given population.

ENTX 745 EPIDEMIOLOGY (Credit, 3 hours). This course focuses on the origin, pathology, and treatment of epidemic diseases. Special attention is given to the molecular response associated with epidemic diseases. The risk assessment and risk management of epidemics to the general population is also discussed.

ENTX 751 REPRODUCTIVE PHYSIOLOGY (Credit, 3 hours). This course is designed to provide an intricate profile of the basic reproductive processes in mammals, primarily humans, as well as the biophysical mechanisms and functions associated with the reproductive system.

ENTX 752 ADVANCED HUMAN NUTRITION (Credit, 3 hours). This course is designed to provide information about daily nutrition. Topics include eating balanced meals, vitamin and essential minerals and nutrients, absorption and metabolism of nutrients, organic harvesting of fruits and vegetables, and diseases and health-related conditions associated with malnutrition and or starvation.

ENTX 753 RECENT ADVANCES IN VIROLOGY (Credit, 3 hours). This course offers an advanced analysis of the biology and pathogenic effects of animal viruses. Recent advances and discoveries in the field of virology are discussed. The latest methods of virus detection and treatment are also discussed.

ENTX 754 PARASITOLOGY (Credit, 3 hours). The pathogenic effects of parasites in humans in discussed. The host-parasite relationship is studied in detail. The identification, detection, symptoms, diagnosis, and treatment of parasitic disease are featured. The epidemic risk associated with parasitism is also assessed.

ENTX 755 MOLECULAR IMMUNOLOGY (Credit, 3 hours). This course focuses on cell-mediated immune responses. Special emphasis is given to the formation of the immune system at the molecular level, as well as the antigen-antibody

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relationship, the molecular structure of immunoglobulins, auto-immunity, and immune deficiency diseases and treatment.

ENTX 771 PLANT PHYSIOLOGY (Credit, 3 hours). This course features detailed descriptions of functional mechanisms and metabolic pathways associated with plants. Other topics include plant photosynthesis, growth regulation, nutrition, and the water cycle.

Research

ENTX 799 TOXICOLOGY RESEARCH PRACTICUM (Credit, 3-6 hours). This course provides the opportunity for students to conduct basic and applied research under the direction of an Environmental Toxicology faculty member. Students will develop questions related to toxicological research and conduct practical research aimed at answering the question. Emphasis will be placed on the use of “the scientific method”, making scientific observations, and recording data. Emphasis will also be placed on data analysis, interpretation and data presentation in the form of abstracts, scientific papers, and research proposals. This course is open only to those students who have not yet qualified for candidacy.

ENTX 800 DISSERTATION RESEARCH (Credit, 3-9 hours). Each student is required to conduct research that is aimed at producing a dissertation. The student and supervising faculty will choose a research topic related to toxicological research and conduct the research in a cooperative manner. This course is open only to those students who have qualified for candidacy. Each student must perform dissertation research in a timely manner and submit a written dissertation.