

# DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCES

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## Programs

**Interim Chair:** Charles Miller, III, PhD

### Mission

The Department of Environmental Health Sciences conducts research and educates culturally competent scientists and leaders to address the impact of the environment on the health of populations through scholarly research and hands-on practice experiences in public, private, not-for-profit and academic sectors around the world.

### About EHS

The Department of Environmental Health Sciences (EHS) engages in multi-faceted research and prepares culturally competent professionals to address all aspects of our environment: physical, chemical, biological, social, and policy. The health of communities is inextricably linked to the environment and pollutants disproportionately impact minority populations. Safe air, water, soil, and food are prerequisites for health. EHS graduates are leaders in public, private, not-for-profit and academic sectors globally.

The EHS transdisciplinary research portfolio spans basic toxicology to clinical biomarker science and community-engaged environmental health studies. We place priority on countering environmental health disparities locally, in the Gulf Coast region, across our nation, and around the world. EHS faculty have expertise in environmental health, toxicology, water quality, industrial hygiene, environmental health policy, community-based studies and resiliency.

## Graduate Degrees

- Disaster Management, MPH (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/disaster-management-mp/>)
- Environmental Health Science, PhD (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/global-environmental-health-science-phd/>)
- Environmental Health Sciences, MSPH (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/environmental-health-sciences-msp/>)
- Health and Safety Management, MPH (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/occupational-health-safety-management-mp/>)
- Industrial Hygiene, MSPH (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/environmental-health-industrial-hygiene-msp/>)
- Occupational and Environmental Health, MPH (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/occupational-environmental-health-mp/>)

## Graduate Certificates

- Disaster Management and Resilience Certificate (Graduate) (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/disaster-management-resilience-certificate/>)
- Disaster Management Certificate (Graduate) (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/disaster-management-certificate/>)
- Environmental Health Certificate (Graduate) (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/environmental-health-certificate/>)
- Health and Safety Management Certificate (Graduate) (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/health-safety-management-certificate/>)
- Industrial Hygiene Certificate (Graduate) (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/industrial-hygiene-certificate/>)
- Occupational and Environmental Health Certificate (Graduate) (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/occupational-environmental-health-certificate/>)

## Courses

### Global Environmental and Health Sciences (GEHS)

#### **ENHS 6030 Survey of Environmental Health (3)**

This course is designed as a survey course which introduces students to basic environmental health topics and it fulfills the school core requirement. The course focuses on environmental factors impacting human health and the environment. Sources of these factors, methods of identification, recognition, evaluation and regulatory framework control are discussed. Factors might include health hazards associated with contaminated water, food and air, vectors of disease, exposure to toxic chemicals, environmental justice, regulations, and safety in the work place.

#### **ENHS 6110 Global Climate Change: Issues in Public Health Policy & Governance (3)**

The objective of the course is to provide students with a thorough understanding of global climate change phenomenon, the public health issues associated with it, and the role of policy and governance in tackling this problem. In line with this objective, the course examines the scientific, political and socioeconomic factors influencing public health policy development, adaptation and compliance in response to the global climate change problem. The course also analyzes the current policy and governance intervention models, and sheds light on direction for the future.

#### **ENHS 6220 Health & Safety Training (3)**

This course addresses a systems approach to developing and evaluating health and safety training programs. Principles and techniques are presented for effectively assessing training needs, developing learning objectives, designing training programs, identifying and developing training evaluation measures and designing evaluation studies. Practical experience with the topics is encouraged by case studies and class exercises involving health and safety training program development and evaluation. Computer-based training issues are emphasized.

#### **ENHS 6300 Radiological Health (3)**

This course is an introductory course in health physics, medical uses and university uses of ionizing radiation. The course includes radiation protection for both workers and general public. The course is designed to meet the needs Industrial Hygienists. Topics include nuclear reaction terminology, the interaction of alpha particles, electrons, and photons with matter, basic instrumentation for radiation protection, and the use of Poisson counting statistics, radiation medicine issues including radiation epidemiology, internal dissymmetry, use of the LLNL code Hotspot for dispersion calculations, and various advanced topics, including nuclear weapons effects.

#### **ENHS 6320 Workplace Wellness (3)**

Health, as it relates to the workplace, is created by two major forces; what employees bring with them into the workplace (e.g. personal resources, health practices, beliefs and attitudes) and the impact of the workplace on employees (e.g. organization of work in both a physical and psychological sense). Health promotion focuses on the elements that make up a healthy workplace and includes the physical environment, health practices and social environment & personal resources. This course focuses on the total well-being of individuals and groups within a corporate and community context. It emphasizes a holistic approach to achieving workplace, community, and personal wellness.

#### **ENHS 6420 Global Food Safety and Public Health (3)**

This course is designed for students who are interested in local, national, and international food safety. Food resources, production, biological, chemical and radiological contaminants are discussed. Focus will be on health effects resulting from exposure to contaminated food. Sanitary regulations/codes addressing food safety including inspection of food establishments, investigation of food outbreak diseases will also be discussed. Genetically modified foods will also be addressed. Site visit(s) to food establishments could be arranged (when possible) with Louisiana Sanitarian Services.

#### **ENHS 6430 Disaster & Emergency Communication (3)**

The course is a fast-paced, interactive course that focuses on the essential knowledge and tools needed to navigate the harsh realities of communicating to the public, media, and stakeholders during an intense public emergency, including terrorism. The course content will meet the crisis communication training needs of distinct groups (e.g., public health professionals, medical and health professionals, emergency response officials, community and civic leaders, the private business sector and volunteer organizations) at the community, regional and national level.

#### **ENHS 6450 Disaster & Emergency Communication (3)**

Future public health professionals should be aware of and understand the impact of climate on the health and well being of populations around the world. In this introductory level course, students will examine what climate change is, the environmental factors it influences, how those environmental factors impact health, who are the most vulnerable, how to deal with climate change from a public health perspective, and how we might answer future questions through evidence-based research. Current literature, reports, and relevant case studies inform class lectures, student-directed dialogue, and final presentations. The course will utilize experts on various topics in addition the primary instructor. This course is an elective for all SPHTM students.

#### **ENHS 6510 Water Quality Management (3)**

The course presents the basic concepts concerning policy, evaluation, and implementation of pertinent water quality management issues. Topics of focus include: water quality standards and criteria; principles of water quality management; regulatory considerations; immunological aspects; eutrophication; ecotoxicology; diffuse pollution and global aspects of sustainable water quality control strategies.

**ENHS 6540 Occupational Health (3)**

This course provides a foundation in occupational health for physicians and professionals working in health and safety programs. The course provides an overview of: regulatory issues in occupational health; occupational health services, systems and policy; occupational toxicology and biological monitoring; occupational diseases including pulmonary dermatology; hearing conservation and hearing loss; workers compensation and return to work; and ergonomics. The course uses an interactive case study approach.

**ENHS 6550 Environmental Health Management (3)**

This course explains the fundamentals of environmental health and how they fit into the larger context of public health security. It highlights the elementary science of environmental exposure of humans to toxic chemicals and microbes, and in this way provides a context and basis for preventative policy and management responses to issues, policy development processes, policy tools and environmental laws-their weaknesses and strengths. It also introduces students to environmental management systems and practices. Students are given case-study based assignments to encourage their skill development in applied environmental health management

**ENHS 6560 Environmental Health Microbiology (3)**

This course is designed to provide understanding about microbial pathogens of public health concern and the role of the environment, including water, waste, air and food, in the transmission of infectious diseases. We will explore specific pathogens that cause environmentally transmitted diseases, their detection using both conventional and advanced molecular methods, their prevention and control by technological and other measures, and how the health risks posed by these pathogens are assessed. This course focuses on emerging issues of pathogens in the environment at both local and global levels. Prerequisite(s): ENHS 6030 or GEHS 6030.

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**ENHS 6600 Principles of Toxicology (3)**

This course focuses on the fundamentals of toxicology and the mechanisms by which environmental and occupational chemical agents affect human health. The principles and mechanisms will be approached in three areas: General principles: Route of exposure; dose response; absorption, distribution, storage, metabolism and excretion; Effects on target organs: liver, kidney, blood, respiratory system and nervous system; and Application of the principles of toxicology using: solvents, pesticides and metals. At the end of this course, the student will be able to apply the principles of toxicology for compounds found in the environment and workplace

**ENHS 6610 Toxicology of Environmental Agents (3)**

The classes of toxicants and their actions are studied in detail in Toxicology of Environmental Agents. Mechanisms and targets of the general classes of toxicants are emphasized. Students are expected to demonstrate ability to use and interpret the current toxicological literature in this course. Prerequisite(s): ENHS 6600 or GEHS 6600.

**Prerequisite(s):** ENHS 6600 or GEHS 6600.

**ENHS 6620 Physical Agents & Ergonomic Hazards in the Workplace (3)**

Occupational exposure to temperature extremes, abnormal pressure, noise, mechanical vibration, non-ionizing radiation, and cumulative trauma/ergonomics are discussed in lecture sessions. The fundamental physics, health effects, and occurrence of these agents, along with methods for evaluating the extent of exposure and approaches to controlling them are discussed in lectures and appropriate measurement instrumentation is demonstrated. A laboratory session on noise measurement is included. Applicable exposure standards, regulations, and guidelines are covered in detail. Prerequisite(s): ENHS 6720 or GEHS 6720.

**Prerequisite(s):** ENHS 6720 or GEHS 6720.

**ENHS 6700 Principles of Safety (3)**

This course is designed to give the student an introduction in the field of safety and prevention management. Broad areas and topics that are covered are management and accountability, policy development and evaluation, hazard identification, job safety analysis, safety training, applied engineering principles (slips, falls, cuts, electrocution, material handling, excavations, confined spaces crane use), emergency operations planning and social-behavioral aspects of safety.

**ENHS 6720 Principles of Industrial Hygiene (3)**

This course provides the student with an introduction into the field of Industrial Hygiene. Topics covered include an overview and historical perspective of Industrial Hygiene, anatomy and physiology of the skin and lungs, occupational diseases and inhalation toxicology, chemical agents, biohazards, ergonomics, indoor air quality, ventilation systems, lab safety, personal protective equipment, Hazard Communication and other OSHA standards. Examples from case studies work experience will be discussed. The course also allows for discussion of topics of interest to the class.

**ENHS 6900 Public Health Threats in Suriname (3)**

The course examines key public health issues affecting the health of Suriname's ecosystem and its population. Through a series of lectures and fieldtrips, students will learn about the role of the ecosystem as a vital component of community health. Special area of focus will be the medicinal characteristics of plants. The course examines the risks posed by environmental contamination, specifically those risks related to mercury released from some small-scale gold mining operations. Students will employ community-based participatory research strategies to assess, manage, and communicate those risks. The course will also examine the leading causes of morbidity and mortality in Suriname.

**ENHS 6910 Environmental Aspects of Disaster Management (3)**

This course examines the fundamentals of environmental health and consequence management through the lens of disaster situations, including technological, man-made, and natural disasters. Lessons learned from historical incidents and current threats alike are examined throughout the course. Environmental health and population health challenges that arise during disasters are thoroughly analyzed. Climate change and other influencing factors are discussed. Operational response models unique to disasters are explored. Preparedness and response frameworks are introduced. Current practice, literature, and relevant case studies inform class lectures, student-directed dialogue, and projects.

**ENHS 6920 Environmental, Monitoring, Sampling & Analysis in a Disaster (3)**

This course is designed to provide students with necessary knowledge and tools for sampling and monitoring of the environment following a disaster such as floods, hurricanes, earthquakes, explosions etc.. During this course, students will also be exposed to field sampling and become familiar with laboratory instruments used for chemical, biological and physical sample analysis.

**ENHS 6930 Planning and Implementation in Disaster Management (3)**

The United States is among other global communities that attempt to prepare its citizens for potential mass casualty events such as natural disasters, terrorism, or a pandemic flu outbreak. This course introduces disaster theory and overviews the United States' National Response Framework. Core population health issues that present during the management of disasters are examined. Developing preparedness at the local level is emphasized. Fundamental concepts of emergency management and leadership are discussed.

**ENHS 6950 Psychosocial Aspects of Disaster (3)**

The course covers the theoretical development, history, and empirical studies of the psychosocial dynamics and sequelae of disasters. Characteristics of environmental health disasters, reactions and risk factors, as well as trends in disaster mental health are examined. Emphasis is placed on inclusion of psychosocial considerations in the planning, preparation, and very early intervention phases of a disaster. Vulnerable populations are of particular interest in highly interactive case-based learning through reflection labs for application in situations such as natural disaster, environmental health crises, pandemic illness, or threats to national security. Baseline resilience planning is required of all students planning to work in disaster or emergency response fields.

**ENHS 6960 Public Health Law (3)**

Population-based preventative health intervention is a major focus of public health. Public health law speaks to the legal aspects of delivering this intervention to the society. This course introduces students to the functions and outcomes of public health protection and practice. It covers a variety of topics such as the public health powers of the federal, state and local governments; civil liberties in matters such as quarantine, isolation and mandated medical testing; access to healthcare; liability of healthcare workers; and international law on the duties and rights of countries to control the spread of infectious diseases.

**ENHS 7000 Departmental Seminar (0-1)****ENHS 7100 Community Resilience Public Health Discourse (3)**

This course examines community resilience (CR) in terms of a community's ability to absorb, recover from, and adapt to natural, technological, and man-made disasters. Community resilience is analyzed across four major dimensions of environmental, social, political, and economic factors. Students are expected to integrate and discuss the intersecting nature of the four dimensions in articulating and writing about their knowledge of CR. The primary focus is that of being able to locate and analyze CR indicators in collaboration with EM personnel, community citizens, and other leaders in emergency planning, preparedness, response and recovery efforts. Prerequisite(s): ENHS 6030\* or GEHS 6030. \* May be taken concurrently.

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\* May be taken concurrently.

**ENHS 7110 Industrial Ventilation & Chemical Hazard Control (3)**

This course covers the control and management of chemical hazards in the workplace and indoor environments through engineering, administrative change, and personal protective equipment. The selection, use, and limitations of respiratory protective equipment are discussed. Engineering controls covered include product substitution, process isolation, and ventilation. The fundamentals of design and operation of local exhaust and general dilution ventilation systems are covered in detail and include basic air flow, general dilution ventilation, exhaust hood design, duct design, fans, air cleaning and recirculation, system balancing, system evaluation and special ventilation systems. A laboratory session on evaluating ventilation system performance is included. Prerequisite(s): ENHS 6720 or GEHS 6720.

**Prerequisite(s):** ENHS 6720 or GEHS 6720.

**ENHS 7230 Fundmtls of Prjt Mgmt for ES&H (3)**

This course focuses on management of environmental health and safety risks, as well as measurement and evaluation of industrial hygiene and safety performance. Specific course topics include environmental and hazardous materials management, emergency planning and response, crisis communication, accident investigation, the development and interpretation of risk assessments, risk perception and communication, economics and risk/benefit analysis, comparative risk assessment, laws and regulations pertaining to risk assessment, and management and the design of risk management plans. Report writing and interpretation are emphasized.

**ENHS 7240 Applying Systems Thinking to EH&S (3)**

This course complements and supplements ENHS 7230, Fundamentals of Project Management for EH&S. It is an introduction to methods of systematically integrating health and safety programs into standard management systems used by organizations. Topics emphasized include leadership, strategic planning, project management, management of multidisciplinary teams, regulatory affairs management, voluntary standards systems, professional ethics, labor relations, and "selling" health and safety initiatives to all levels of the organization and the public. Systems thinking is emphasized throughout the course. No prerequisites required.

**ENHS 7260 Financial Aspects ES&H (3)**

The purpose of this class is to teach students how to use economic and financial analyses to manage EHS programs by developing analytic and inductive reasoning skills that are prerequisites for becoming a successful manager. The course will address some basic financial managing concepts that mid-level EHS managers and professionals will commonly use or be exposed to in a business setting. These concepts include cost behaviors, profit analysis, budgeting, financial ratios, project economics and return investment analysis.

**ENHS 7270 Practical Applications of Environmental Health Research (3)**

This course is designed to provide students an approach to the conceptualization, design, and operational logistics for planning and implementing studies and responses to environmental health problems and field studies. The course will focus on applied public health problems and situations that may challenge an environmental health professional in determining studies that can be implemented. The course is applicable to environmental health students focusing on epidemiology, health education, environmental sciences, or other field application of environmental public health practice. Students are expected to develop and present a study proposal applicable to their specific area of environmental health. The methods described are the conceptual approach to problem solving in environmental health practice. Problems discussed will apply to many environmental health issues including environmental assessment and health studies. Prerequisite(s): BIOS 6030\*. \* May be taken concurrently.

**Prerequisite(s):** BIOS 6030\*.

\* May be taken concurrently.

**ENHS 7310 Occ Laws and Compliance (2)**

This course is designed to introduce the most important EHS management systems for multinational companies from the US and other countries. The course introduces students to ISO-harmonized management systems. Students gain skills in making the transition from traditional numeric specifications of governmental command-and-control regulations to ISO-harmonizing auditing systems, involving root cause analyses of system requirements.

**ENHS 7400 Field/Lab Applications of Environmental Health Practice (3)****ENHS 7500 Air Sampling & Analysis (3)**

The principles and techniques for measuring and evaluating airborne contaminants in the work and community environments are presented in lectures and practiced in laboratory sessions. Covered topics include air flow measurements, aerosol science, particulate sampling with and without size separation, optical microscopy, active and passive sampling of gases and vapors, direct reading instruments, stack sampling, atmospheric dispersion modeling, and sampling strategy and statistical data analysis. Prerequisite(s): BIOS 6030\*. (\*May be taken concurrently.)

**Prerequisite(s):** BIOS 6030\* or SPHL 6050\*.

\* May be taken concurrently.

**ENHS 7510 Emerging Issues in Water Qual (3)**

Burgeoning human population and urbanization is creating increased demands on fresh water resources and generating larger and more concentrated waste streams. Droughts throughout many parts of the world also have placed unique challenges on historically abundant river systems. Therefore, many communities are considering the utilization of alternative water resources, including desalination of brackish waters and the reuse of wastewater for potable and non-potable applications. This course will investigate, discuss, and debate major emerging water quality issues which threaten our water sustainability and the regulatory paradigms to address these challenges. Specific issues include emerging opportunistic premise plumbing pathogens, endocrine disrupting chemicals, pharmaceuticals, unregulated disinfection by-products, perfluorinated organic compounds, algal toxins, and others. Prerequisite(s): ENHS 6030 and 6510.

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**ENHS 7550 Human Biomonitoring & Health (3)**

This advanced applied course introduces human biomonitoring (HBM) concepts and approaches for understanding the myriad ways humans interact with the environment, primarily from the perspective of chemical exposures. Students will gain skills needed to design and conduct population-level biomonitoring studies. The course involves a literature critique and practice in designing biomonitoring studies that address environmental health issues relevant to public health and policy.

**Prerequisite(s):** ENHS 6030 and 6600.

**ENHS 7620 Health Risk Assessment (3)**

What is risk? How are exposures to environmental chemicals deemed risky (or not)? This course will cover the rationale and application of health risk assessment in the context of chemical toxicology and human health. Principles of dose-response and the multi-step process in human health non-cancer and cancer risk assessments will be covered. Quantitative deterministic and probabilistic methods and tools will be used in conjunction with risk interpretation, presentation, and communication. Prerequisite(s): ENHS 6600 or GEHS 6600.

**Prerequisite(s):** ENHS 6600 or GEHS 6600.

**ENHS 7750 Environmental Policy (3)**

The course introduces students to the concepts of public health policy with an emphasis on environmental health. The course describes the relationship among public science, policy, and practice and demonstrates the application of this relationship through a series of real cases in environmental health laws, policies, regulations and statutes in the context of public health. Through "hands-on" experience, students examine the public implications of contemporary environmental public health problems.

**ENHS 7950 Psychosocial Interventions in Disasters, Crises, or Brief TX Situations (3)**

The course covers the history, development, and application of both brief solution-focused and crisis intervention within the context of biopsychosocial resolution in healthy human development and social functioning. Emphasis is placed on practical application of techniques in situations such as natural disaster, death, traumatic injury or illness, PTSD, ATSD, violent crime, terrorism, suicide, chronic physical and mental conditions, and severe family dysfunction. The clinical-community approach is demonstrated through case-based learning and simulations. Prerequisite(s): ENHS 6950 or GEHS 6950.

**Prerequisite(s):** ENHS 6950 or GEHS 6950.

**ENHS 7990 Independent Study (1-3)**

Masters students and advisor select a topic for independent study and develop learning objectives and the expected written final product.

**ENHS 8850 Methods in Toxicological Research (3)**

This course is made available for students pursuing doctoral studies. A suitable research problem is identified by the student after consultation with the mentor. This should be done prior to starting the course. Modern experimental techniques are used. Research methods are discussed, demonstrated, and then carried out by the student. The student prepares a research project report to successfully complete the course. Ideally this report will be published as a manuscript. Prerequisite(s): (ENHS 6600 or GEHS 6600) and (ENHS 6610 or GEHS 6610) and (ENHS 7620 or GEHS 7620).

**Prerequisite(s):** (ENHS 6600 or GEHS 6600) and (ENHS 6610 or GEHS 6610) and (ENHS 7620 or GEHS 7620).

**ENHS 8860 Genetic Molecular Toxicology (3)**

Genetic and Molecular Toxicology is a doctoral level course that addresses the causes and effects of alterations to the hereditary material and the elucidation of fundamental mechanisms of toxicity. Spontaneous and chemically induced mutations are covered in depth in this course. The roles of cellular and genetic regulation in the induction of responses to DNA damage are explored. Merits of various experimental systems for the detection and analysis of DNA damage and mutations are examined. Effects of mutations, polymorphisms, and epigenetic factors on human disease (cancers, aging, and other chronic diseases) and health maintenance are discussed in this course. Prerequisite(s): (ENHS 6600 or GEHS 6600) and (ENHS 6610 or GEHS 6610) and (ENHS 7620 or GEHS 7620).

**Prerequisite(s):** (ENHS 6600 or GEHS 6600) and (ENHS 6610 or GEHS 6610) and (ENHS 7620 or GEHS 7620).

**ENHS 8990 Doctoral Independent Study (1-3)**

Doctoral students and advisor select a topic for independent study and develop learning objectives and the expected final written product.

**ENHS 9970 Dissertation (0)**

Doctoral candidates who have defended their prospectus and are engaged in research.

**ENHS 9980 Dissertation Research (2)**

Course may be repeated up to unlimited credit hours.

**Maximum Hours:** 99

**ENHS 9990 Dissertation Research (2)**

Doctoral students who have completed course work but not defended their prospectus.

**Maximum Hours:** 99