

# DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCES

---

## Programs

Chair: Melissa Gonzales, PhD, MS

### Environmental Health Sciences

**Environmental Health Sciences** prepares students to improve the health of populations through strengthening environmental health protection and management systems, building stronger communities, providing technical assistance, and facilitating health risk reduction strategies in an increasingly complex and changing world.

**Environmental Health Sciences Programs** train students to identify health impacts and develop strategies to reduce health risks across work, home, and ambient environments posed by natural and man-made sources and disasters, which are modified by climate change and unequally distributed among communities.

**Our mission** is to equip the next generation of environmental public health leaders with the knowledge and skills to protect the health from the impacts of environmental exposure.

**Our vision** is a world in which one's health status and life chances are supported by the environments in which they live, work, and play.

## Graduate Degrees

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

*Graduate degrees in Occupational and Environmental Health, MPH and Occupational Health and Safety Management, MPH will not be admitting students for academic year 2024-2025.*

## Graduate Certificates

- Disaster Management Certificate (Graduate) (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/disaster-management-certificate/>)
- Industrial Hygiene Certificate (Graduate) (<https://catalog.tulane.edu/public-health-tropical-medicine/environmental-health-sciences/industrial-hygiene-certificate/>)

*Graduate certificates in Occupational and Environmental Health, Occupational Health and Safety Management, Disaster Management and Resilience, and Environmental Health will not be admitting students for the academic year 2024-2025.*

## Courses

### Environmental Health Sciences (ENHS)

#### 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 6080 Fundamentals of Environmental Health Sciences (3)

This course introduces students to environmental health concepts and principles used to anticipate, evaluate, and reduce health risks posed by chemical, biological or physical agents in their environment with an emphasis on our changing climate. The course will be taught as a series of modules and assignments designed to provide a framework of fundamental environmental health sciences from which to expand upon to understanding how environmental hazards and our changing climate affect health. Case studies and discussions will bridge the gap between concepts and application to real world scenarios. Contemporary examples of environmental issues will be discussed. After completing this course, students are expected to be able to apply fundamental environmental health paradigms to the critical public health need for understanding the impact of environmental agents in a complex and changing world.

**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 introduces students to 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.

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

This course presents the application of evidence-based principles that help leaders in government and public health persuade, inform, and ensure the health of a population in a crisis. This interactive course will use a combination of site visits, case studies, and interactive examples to highlight the principles when dealing with uncertainty, communication, building trust and empathy, cross-cultural communication, and leadership ethics. Students will also learn key skills that will give them the tools to apply these principles in the field of public health.

**ENHS 6450 Climate Change and Public Health (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)**

This is an introductory course in Water Quality Management. Students will explore the link between water quality and public health. Topics cover the foundations of surface water quality, groundwater quality, and stormwater quality. Students will learn the principals of potable water and wastewater treatment permitting and treatment as well as the scientific causes, consequences, and solutions of pollution in lakes, rivers, wetlands, and groundwater. At the completion of this course, students should be able to discuss nonpoint and point source pollution and interpret the physical, chemical, and biological indicators of water quality.

**ENHS 6540 Principles of Occupational Health (3)**

The course addresses occupational health topics including some of the leading occupational disease hazards, their evaluation and control. Concepts of exposure in the workplace and related health outcomes, toxicological updates on selected chemical and physical agents, as well as exposure evaluation are discussed.

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

This course examines the relevance of sustainable management of natural resources to public health. It explores the science of natural and built environmental stressors and their impacts on human health along with a number of model environmental health and natural resources management best practices from policy and management perspectives. Students learn to develop and apply appropriate natural resources management plans, environmental health plans, and environmental management systems to a number of problem scenarios including disaster scenarios. Topics include key environmental media as well as forests, wetlands, and agricultural land management. Emphasis will be placed on interventions for environmental toxins and vectors of diseases and the impact of global climate change on environmental public health. Students are given case-study based assignments to develop skills 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.

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

This course presents the fundamental principles of toxicology and the mechanisms by which environmental and occupational chemical agents may alter human health. There are three major themes in this course: 1) General principles: chemical exposure, route, dose response; absorption, distribution, storage, metabolism and excretion; 2) Non-organ toxicology, e.g. epigenetic, mutagenic, carcinogenic, and developmental effects of chemicals. 3) Systemic toxicity of chemicals to liver, kidney, blood, lung, etc.

**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.

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

This course provides an overview of safety fundamentals in the workplace and focuses on the safety management programs; applicable laws, regulations and standards; hazards and controls; safety training; emergency operations planning; and human performance elements of safety improvement. The student will gain a basic understanding of programmatic safety management as well as applied safety engineering principles related to areas including, but not limited to: electrical safety, fire protection and prevention, heat and cold, transportation safety, noise and vibration, personal protective equipment, etc. Class assignments will focus on application of safety principles in the student's workplace. Students, through individual, collective and peer review contributions, will develop a safety walkthrough checklist linking items important to safety in multiple key technical areas.

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

This course is designed to introduce the field of Industrial Hygiene. The objective of the course is to present an overview and historical perspective of Industrial Hygiene, anatomy and physiology of the skin and lungs, occupational diseases, inhalation toxicology, chemical agents, biohazards, ergonomics, noise, thermal stress, indoor air quality, ventilation systems, laboratory safety, radiation safety, personal protective equipment, Hazard Communication and other OSHA standards and community exposures and emergency planning.

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

Students will gain a cross-disciplinary knowledge of the practical, interrelated aspects of public health preparedness, homeland security and disaster management. Emphasis will be placed on developing an understanding of these fields through the lens of real-world case studies and scenarios. Students should become well prepared for future study in this dynamic and evolving discipline.

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

Utilizing a strong person-in-environment and ecosystems focus, this course addresses the unique dimensions of mental health issues in disaster or complex community emergencies. The course provides instruction in the Incident Command System, including systemic planning, activation, and evaluation of the functions of psychosocial health services when dealing with a disaster. The course integrates interdisciplinary knowledge and skills from micro, mezzo and macro levels for addressing psychosocial reactions and needs prior to and in the wake of a disaster or major crisis. Students experience a variety of learning activities including online FEMA instruction; live lecture with class discussion, case simulations, field visits, exams, reflection, labs and papers focused on response models that integrate the psychosocial dimension.

**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)**

Public health law speaks to the legal aspects of delivering public health interventions to the society. This course introduces students to the functions and outcomes of public health law from local to global and provides a hands-on legal tool for public health protection and practice. It covers a variety of topics such as civil liberties in matters such as quarantine, isolation and mandated medical testing; access to healthcare and health disparities; incentives to vaccine makers, authorization of drugs in declared public health disaster/emergency situations, international law on controlling spread of infectious diseases, the role of the World Health Organization and other global entities in protecting public health, and public health issues arising from migrants and refugee problems.

**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.

**ENHS 7230 Fundamentals of Project Management for Environmental Sciences (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 Environmental Health and Sciences (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 7310 Occupational Laws and Compliance (2)**

This course helps students understand regulation of workplace safety and health under the Occupational Safety and Health Act of 1970 ("OSH Act") primarily covering employer responsibilities, employee rights, and regulatory compliance efforts. The course provides an overview of the history of occupational safety policies culminating in the creation of the OSH Act. Students learn the roles of the (1) Occupational Safety and Health Administration ("OSHA"), (2) National Institute of Occupational Safety and Health ("NIOSH"), and (3) Occupational Safety and Health Review Commission ("OSHRC"). Important federal statutes, regulations, court decisions and OSHA's rulemaking, standard interpretations, and resources to assure occupational safety compliance are covered.

**ENHS 7400 Field/Lab Applications of Environmental Health Practice (3)**

This course consists of field and laboratory work dealing with the identification, assessment and isolation of environmental health problems. It is designed to provide the students an opportunity to observe and work with real-life settings of environmental health problems in the field, i.e. food establishments, schools, water, sewage, etc. Students conduct environmental health exercises and make analysis of problems situations on-site. Students collect and analyze environmental samples when possible. Written reports of each exercise are required. All reports will be discussed and methods of remedies for environmental health violation corrections will also be discussed.

**ENHS 7500 Air Sampling & Analysis (3)**

This course helps students understand regulation of workplace safety and health under the Occupational Safety and Health Act of 1970 ("OSH Act") primarily covering employer. 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\*, SPHL 6050\* or 6850.

\* May be taken concurrently.

**ENHS 7510 Emerging Issues in Water Quality (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.

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

The environment plays a major role in human health and disease. Exposure to chemicals and other stressors such as lifestyle factors are intrinsically linked with adverse health outcomes. This advanced course discusses the role human biomonitoring (HBM) in epidemiological studies to assess the occurrence, extent of chemical exposures and identify populations at risk of adverse health outcomes by measuring biomarkers in biological samples, such as in urine, blood, and nails. The course introduces HBM concepts and approaches for understanding the myriad ways human interact with the environment, primarily from the perspective of chemical exposures. Students will gain the knowledge needed to design and conduct population-level biomonitoring studies to understand public health risks of chemicals exposure and for better policy makings to protecting health.

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

**ENHS 7610 Applied Data Science for Climate and Health (3)**

This course is designed to provide students with the knowledge and practical skills to use data science techniques in addressing the complex challenges at the intersection of climate change and health. With a strong focus on practical applications, the course first introduces fundamental concepts in climate change, epidemiology, and biostatistics and follows with data science methods for collecting, analyzing, and interpreting climate and health data, enabling students to identify climate change-related environmental risk factors and to engage in evidence-based decision-making and policy development. Lectures focus on the statistical methods and data science application to evaluate the health impacts of climate change-related exposures such as wildfires, extreme temperature events, tropical cyclones, and drought etc. It is open to MS, MPH, and PhD graduate students at the School of Public Health and Tropical Medicine and other Schools with appropriate permissions.

**Prerequisite(s):** SPHL 6050 and 6060.

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

This course develops the qualitative and quantitative skills necessary to evaluate the probability of adverse health effects resulting from exposure to environmental contaminants/chemicals. Basic concepts of qualitative and quantitative risk assessment are demonstrated using practical case studies and review of the primary literature. Emphasis is placed on hazard identification, dose-response evaluation, exposure assessment, and risk characterization. Integration of risk assessment with risk management and communicating risks to the public are discussed. Regulatory aspects of risk assessment in the promulgation of environmental standards are presented. Disaster risk estimation and assessment is not a content area covered in this course (e.g. probability of a catastrophic storm event and flood risks under specific scenarios) nor is microbial risk assessment (e.g. foodborne or waterborne pathogen risk assessment).

**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 policy implications of contemporary environmental public health issues.

**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 8100 Advanced Environmental Health (3)**

Advanced Environmental Health is a doctoral level course that is restricted to students who are admitted to doctoral programs. The course is taught by the departmental members who have extensive research experience. Students will be challenged with contemporary research problems in the field of environmental health that span topics that include environmental health in disaster situations, identifying effects of environmental chemicals, and biological contaminants in the water supply. The course is designed to provide a unified, broad, and advanced experience in environmental health issues for doctoral students.

**ENHS 8200 Environmental Health Methods (3)**

Environmental Health Methods is a doctoral level course for students enrolled in doctoral programs. The course is taught by the departmental members with active environmental health research programs. Students select an area for study and work closely with a faculty member to 1) identify an environmental health research question that can be approached within a semester, 2) review the pertinent literature on the topic and form a testable hypothesis, 3) develop and employ the appropriate methodological approaches, 4) prepare and analyze data, 5) identify an appropriate journal or other publication forum, and 6) complete a manuscript or report in the appropriate format.

**Prerequisite(s):** BIOS 6040, EPID 7120 and ENHS 8100.

**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.