

# Environmental and Occupational Health — M.P.H.

## Program Director

Padma Uppala

The M.P.H. degree curriculum in environmental and occupational health is designed for individuals with professional practitioner career objectives in the area of environmental and occupational health. It helps prepare them to meet the growing employment market for environmental health specialists, industrial hygienists, geographic information system specialists, and other professions that examine human-environment interactions. Students who complete this curriculum will acquire the professional and scientific skills to perform as environmental quality control professionals in local, state, or federal government health departments/agencies; and in private business/industry. The program has been approved by the State of California Environmental Health Specialist Registration Committee (<http://www.cdph.ca.gov/certlic/occupations/Pages/REHS.aspx>), 1616 Capitol Avenue, Building 174 - 2nd floor Sacramento, CA 95899. Satisfactory completion of this curriculum meets, in part, the eligibility requirements to sit for the registered environmental health specialist (REHS) examination administered by the California Department of Public Health. Satisfactory performance in the examination qualifies individuals for practice as registered environmental health specialists in California and, by reciprocity, in the forty-nine remaining states. Admission into the M.P.H degree curriculum is considered for individuals with a solid science background.

## Learner outcomes

Upon completion of the degree, the graduate should be able to:

- Analyze sources, pathways and routes of exposure to environmental and occupational contaminants and determine populations with high risk; outline mitigation strategies
- Assess and evaluate environmental and occupational hazards pertaining to air, water, food and soil in socio-economically disadvantaged communities both locally and globally and design innovative techniques and devices to improve standard of living and quality of life
- Apply risk assessment and risk management concepts to develop effective guidelines and policies to mitigate and manage environmental and occupational hazards and improve human health outcomes

## Educational effectiveness indicators

Program learner outcomes as evidenced by:

- Signature assignments linked to course and non-course requirements
- Field practicum report
- Culminating experience (<http://llucatalog.llu.edu/public-health/masters-degrees/#mphtext>)

## Prerequisite

In addition to the entrance requirements for all MPH degrees (<http://llucatalog.llu.edu/public-health/masters-degrees/#admissionstext>),

applicants to the MPH program in Environmental and Occupational Health must have:

- Biological science with laboratory (one year)
- General chemistry with laboratory (one year)
- General physics with laboratory (one year)
- Calculus or college algebra (one course)
- Organic chemistry with laboratory (minimum of two-quarter sequence)

## Corequisite

- General microbiology with laboratory (one course), taken during the first two quarters of the program
- Additional units required for the degree

## Program requirements

### Public health core

PCOR 501	Public Health for Community Resilience	5
PCOR 502	Public Health for a Healthy Lifestyle	5
PCOR 503	Public Health and Health Systems	5

### Major

ENVH 515	Food Quality Assurance	3
ENVH 567	Hazardous Materials and Solid-waste Management	3
ENVH 568	Water Quality Assurance	3
ENVH 569	Environmental Sampling and Analysis	4
ENVH 581	Principles of Industrial Hygiene	3
ENVH 587	Environmental Toxicology	3
ENVH 589	Environmental Risk Assessment	3
ENVH 605	Seminar in Environmental and Occupational Health	1
ENVH 566	Outdoor Air Quality and Human Health	3
or ENVH 575	Indoor Air Quality	

### Religion

RELE 534	Ethical Issues in Public Health (or REL_)	3
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<b>Cognates/Electives</b> <sup>1</sup>		12
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### Field experience

Practicum units are in addition to the minimum didactic units required for the degree

PHCJ 798D	Public Health Practicum (Minimum of 8 units/400 hours)
or PHCJ 798A	Public Health Practicum
or PHCJ 798B	Public Health Practicum
or PHCJ 798C	Public Health Practicum

Total Units	56
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<sup>1</sup> Choose from defined cognates (<http://llucatalog.llu.edu/public-health/#programstext>) or select from electives, in consultation with advisor.

## Non-course requirements

### Culminating Experience

In addition to standard culminating experience requirements (<http://llucatalog.llu.edu/public-health/masters-degrees/#mphtext>), all environmental and occupational health students must satisfactorily complete a comprehensive examination prior to graduation. The examination will allow students to demonstrate their ability to integrate

and apply skills and knowledge expected of master's-level environmental health practitioners.

## Normal time to complete the program

1.5 years (9 academic quarters) based on full-time enrollment; part time permitted

## Courses

### **ENVH 414. Introduction to Environmental Health. 3 Units.**

Introduces an overview of the major areas of environmental health, such as ecology, environmental law, and population concerns; environmental diseases and toxins; food, water, and air quality; radiation; noise; and solid and hazardous waste.

### **ENVH 421. Cartography and Map Design. 3 Units.**

Cartographic principles and guidelines, including geodesy, map projections, coordinate and locational systems, scale and distance, direction, vertical factors, mapping methods and techniques, and graphic representation of Earth patterns. Provides the foundation for understanding advanced geospatial technologies including GIS, remote sensing, and global positioning systems.

### **ENVH 422. Principles of Geographic Information Systems. 4 Units.**

Comprehensive overview of the concepts, functions, applications, technologies, and trends pertaining to automated geographic information systems (GIS). Framework for understanding the design, development, implementation, and management of GIS. Topics include: GIS hardware and software considerations, data resources, technical issues and applications in GIS.

### **ENVH 423. Practical Issues in GIS. 4 Units.**

Key tasks and issues faced by GIS managers and practitioners responsible for implementing and managing health GIS systems in government or private-sector organizations. Presents sound principles and approaches for GIS implementation, as well as project management and organizational issues, to provide the necessary foundation of information on alternatives and pitfalls. Main topics include: GIS needs assessment, software/hardware considerations, financial and staffing requirements, project-scope delineation, project planning and control, pilot projects.

### **ENVH 424. Desktop GIS Software Applications. 4 Units.**

Introduces state-of-the-art, PC-based GIS applications. Student acquires the conceptual knowledge as well as the hands-on experience needed to optimally utilize available functions within desktop GIS technology for display, editing, analysis, and presentation of spatial and thematic data. Focuses on ArcView GIS and its analytical extensions.

### **ENVH 434. Advanced GIS Software Applications. 3 Units.**

Comprehensive overview of the concepts, functions, skills, applications, technologies, and trends of modern remote sensing in environmental and health-data acquisition and analysis; as well as applications in related public health issues. Topics include GIS-based image interpretation and data generation, satellite remote sensing, introduction to IDRISI Kilimanjaro and ERDAS Imagine; as well as other modeling tools, such as ArcGIS Modler, Stella, ArcPAD, GPS, CARTALink, etc.

### **ENVH 435. Sources, Capture, and Integration of GIS Data. 3 Units.**

Provides overview of some of the technologies and methods used in capturing, processing, integrating, and displaying GIS data. Topics include: global positioning systems, satellite digital imagery, image processing, aerial photography, digital orthophotography, GIS applications for the World Wide Web, and GIS data sources on the Internet. Fundamentals of conceptual and physical design, construction, currency, and integrity of geospatial databases.

### **ENVH 436. Spatial Analysis with GIS. 4 Units.**

Focuses on GIS functionality suited for modeling and analyzing complex spatial relationships. Basic functions for the selective retrieval of spatial information and the computation or mapping of statistical summaries. Advanced quantitative methods of spatial statistics for analyzing different data-feature types and data structures, and investigating patterns in spatial data. Main topics include: feature manipulation, distance measurement, spatial overlay, proximity analysis, spatial-correlation analysis, point-pattern analysis, spatial interaction, surface analysis, network analysis, grid analysis, and spatial modeling within GIS.

### **ENVH 437. GIS in Public Health. 2 Units.**

Reviews GIS methods and analytical techniques with potential for improving public health research and practice. Fields of public health considered individually. Identifies specific GIS approaches and techniques. Considers specific disciplines, including: epidemiology, health promotion, international health/development, health-care administration, environmental health and contamination, and emergency management. Current applications of GIS technology and methods at the international, national, and local levels.

### **ENVH 438. Introduction to Web GIS. 4 Units.**

Introduces basic Web-based techniques, design and publication of maps, and geographic analysis through the Internet. Students learn to design Web maps and implement geographic analysis via the Internet. Includes lectures, laboratory exercises, and a final project. Discusses understanding REST Web services, building geospatial mashup applications, optimizing Web map services, creating and using geoprocessing Web services, and mobile GIS. Students develop and present an Internet mapping service to the class using application of their choice.

### **ENVH 498. Health Geographics Senior Project. 2,4 Units.**

Three-quarter senior research or applications project conducted during the student's final academic year. Student demonstrates mastery of spatial analysis skills by assessing relevant public and oral presentations. May be repeated for additional credit. Must have a total of 12 units. Paper and oral presentation required during final quarter of registration.

### **ENVH 499. Directed Study/Special Project. 1-4 Units.**

Individual arrangements for undergraduate, upper division students to study under the guidance of a program faculty member. May include readings, literature review, or other special projects. Minimum of thirty hours required for each unit of credit. A maximum of 4 units applicable to any undergraduate degree program.

### **ENVH 509. Principles of Environmental Health. 3 Units.**

Rural and urban environmental factors that affect human-health status, enjoyment of the quality of life, and human survival. Focuses within a framework of air, water, food quality, residential environments, industrial sites, recreational patterns, and environmental risk avoidance. Stresses prevention of disease and promotion of healthful environments. Not applicable toward a major in environmental health.

### **ENVH 515. Food Quality Assurance. 3 Units.**

Principles and techniques of quality assurance for food preparation and prevention of food-borne diseases. Sanitary and safe preparation, storage, transportation, and handling of foodstuffs and products--both commercially and residentially. Criteria and practical methodology of inspection and surveillance techniques, facilities design, and plan checking. Food degradation, contamination, additives, and toxicants. Performance criteria for food handlers, with application to environmental techniques in education, enforcement, and consultation. Field trips.

**ENVH 521. Cartography and Map Design. 2 Units.**

Map design and content, design procedures, production techniques, color selection, use of text, creation of visual hierarchy and visual balance. Explores thematic and general mapping with use of GIS data for mapping purposes. Discusses ArcGIS software. Map critiquing. Provides the foundation for understanding advanced geospatial technology, including GIS, remote sensing, and global positioning systems.

**ENVH 522. Principles of Geographic Information Systems and Science. 3 Units.**

Comprehensive overview of the concepts, functions, applications, technologies, and trends pertaining to automated geographic information systems (GIS). Topics include: GIS hardware and software considerations, data resources, technical issues and applications in GIS.

**ENVH 523. Practical Issues in GIS. 3 Units.**

Key tasks and issues faced by GIS managers and practitioners responsible for implementing and managing health GIS systems in government or private-sector organizations. Presents sound principles and approaches for GIS implementation, as well as project management and organizational issues, to provide the necessary foundation of information on alternatives and pitfalls. Main topics include: GIS needs assessment, software/hardware considerations, financial and staffing requirements, project-scope delineation, project planning and control, pilot projects.

**ENVH 524. GIS Software Applications and Methods. 3 Units.**

Project-oriented course introduces state-of-the-art, PC-based GIS technology and applications. Provides the conceptual knowledge and hands-on experience needed to optimally utilize available functions within desktop GIS technology for modeling, displaying, editing, analyzing, and presenting spatial and thematic data. Focuses on ArcGIS and its analytical extensions, as well as Leica Geosystems ERDAS Imagine.

**ENVH 525. Special Topics in Environmental and Occupational Health. 1-4 Units.**

Lecture and discussion on a current topic in environmental and occupational health. May be repeated for a maximum of 4 units applicable to degree program.

**ENVH 526. Seminar in Geographic Information Systems. 1 Unit.**

Covers various aspects of GIS technology and its applications to health that might otherwise be excluded from the usual and customary health geoinformatics academic curriculum. Topics of interest include metadata creation and management, health geoinformatics spatial data infrastructure, data interoperability, and mobile mapping technology. Presenters with specific expertise invited to cover areas of interest.

**ENVH 527. Geospatial Technologies for Emergency Preparedness and Management. 3 Units.**

Applies geospatial data, tools, and methods to preparedness and emergency management. Examines the current status of the use of geospatial data, tools, and infrastructure in preparedness and disaster management. Explores approaches for the effective integration of existing geospatial tools into the framework of emergency preparedness and management; strategies for improving geospatial decision support in this field; and various other issues related to data availability, security, and policies. Emphasizes technology application.

**ENVH 535. Integration of Geospatial Data in GIS. 2 Units.**

Surveys capturing, processing, integrating, and displaying GIS data. Focuses on public health applications of global positioning systems, satellite digital imagery, image processing, aerial photography, digital orthophotography, GIS applications for the World Wide Web, and GIS data sources on the Internet.

**ENVH 536. Spatial Analytic Techniques and GIS. 3 Units.**

Modeling and analyzing complex spatial relationships through GIS technology. Selective retrieval of spatial information and computation or mapping of statistical summaries. Advanced methods of analysis using spatial statistics.

**ENVH 537. Health-Care Geographics. 2 Units.**

GIS in health services research and the health-care sector. Introduces GIS-based methods of mapping, modeling, and analyzing issues, such as patients' access to health care and services, locating new medical facilities and health services, delineating medical service areas and consumer markets. Presents emerging applications of GIS to the scale of individual facilities and the mapping of the human body itself.

**ENVH 538. Introduction to Web GIS. 3,3 Units.**

Introduces basic Web-based techniques, design and publication of maps, and geographic analysis through the Internet. Students learn how to design Web maps and implement geographic analysis via the Internet. Includes lectures, laboratory exercises, and a final project. Emphasizes understanding of REST Web services, building geospatial mashup applications, optimizing Web map services, creating and using geoprocessing Web services, and mobile GIS.

**ENVH 539. GIS Applications in Environmental Health. 2,3 Units.**

GIS display, modeling, and analysis of environmental hazards/toxicants, as well as population's exposure to environmental contaminants. Includes geography and modeling of hazard sources, hazard surveillance, spatial characterization/modeling of contamination and GIS-enhanced risk assessment/management. Considers the use of GIS for managing public health safety problems. Presents current applications of GIS in environmental health and disaster/emergency response. Third unit requires additional GIS project that includes substantial analysis of environment data and discussions of results through written and oral presentation.

**ENVH 546. Introduction to Spatial Epidemiology. 2 Units.**

Provides overview of GIS-based mapping and statistical methods for describing, displaying, quantifying, and modeling spatial variations in disease, especially with respect to exposures at the small-area scale. Main topics include disease mapping, analysis of spatial clustering of health events, disease surveillance, and ecological modeling. Presents currently implemented spatial epidemiologic applications at the international, national, and local levels.

**ENVH 547. GIS for Public Health Practice. 2 Units.**

Community health assessment and planning, chronic-disease prevention, public health, health-disparities analysis, and immunization.

**ENVH 549. Remote Sensing Applications in the Health Services. 3 Units.**

Comprehensive overview of the concepts, functions, skills, applications, technologies, and trends of modern remote sensing in environmental and health data acquisition and analysis, as well as applications in related public health issues. Topics include GIS-based image interpretation and data generation, satellite remote sensing, remote sensing applications, and case studies in public health. Software tools used include introduction to IDRISI Kilimanjaro and ERDAS Imagine; as well as other modeling tools such as ArcGIS, STELLA, ArcPAD, GPS, CartaLinx, etc.

**ENVH 555. Advanced Remote Sensing Application and Systems Modeling in Health and Earth Science. 3 Units.**

Introduction to “systems science” as both a conceptual approach to analysis and as a methodology for enhancing research and application within the environment, health, and earth systems. Provides students with fundamental knowledge of dynamic modeling tools, particularly focused on using STELLA and iThink (from Isee Systems); as well as other tools that integrate spatial and nonspatial datasets, e.g. ArcModeler, Geode, TerraVIVA, Netweaver, and various SAS tools, etc. Applies “systems thinking and analysis” to specific interdisciplinary issues within public health and other applied sciences.

**ENVH 557. Geographical Techniques for Health and Environmental Analysis. 3 Units.**

Geographic tools for graphic display and spatial analysis of international and U.S. domestic health, epidemiological health services, and environmental health problems and issues. How geographical information systems (GIS); desktop mapping; geocoded, computerized databases and medical geographical applications are used in health and environmental planning, decision making, and research.

**ENVH 558. Global Environmental Health. 2 Units.**

Global implications of human impact on terrestrial, atmospheric, and marine environments. Considers dilution and dispersion of pollutants, climatic changes, endangered species, desertification, deforestation, vehicle emissions, free-trade agreements, renewable resources, and export of hazardous industry to developing nations. Impact of political, economic, and cultural factors on present and future mitigation strategies.

**ENVH 559. Environmental Health for Developing Countries. 3 Units.**

Major challenges associated with environmental health and hygiene practices in developing nations. Water-resource development/operations and maintenance, infection and disease-vector control, pesticide management, food quality and availability, solid-waste management, uncontrolled urban settlements, occupational health, and the implications of localized atmospheric pollutants.

**ENVH 566. Outdoor Air Quality and Human Health. 3 Units.**

Sources and characteristics of air pollutants and their effects on humans and human environment. Methods used in sampling of pollutants, controls, and abatement of air-quality standards violations.

**ENVH 567. Hazardous Materials and Solid-waste Management. 3 Units.**

Production, collection, transportation, treatment, recycling, and disposal of solid wastes and hazardous materials. Toxic effects and hazard-producing characteristics of these materials; and the process of disposal-site design, siting, and operation.

**ENVH 568. Water Quality Assurance. 3 Units.**

Principles and processes involved in providing safe and adequate water supplies. Water-source development, quantity and quality assurance, source and system design, and inspection parameters. Protection of water sources from contamination; and the abatement of, and correction techniques applied to, degraded water quality. Potable water supplies, fresh and saline bodies of water, and municipal liquid-waste disposal.

**ENVH 569. Environmental Sampling and Analysis. 4 Units.**

Practical laboratory experience that serves as an introduction to techniques used in measurement and evaluation of environmental health problems. Techniques pertinent to air, water, and food sanitation. Occupational stressors and radiological health.

**ENVH 575. Indoor Air Quality. 3 Units.**

Social and technical factors associated with nonindustrial, indoor air-quality issues. Ventilation, source assessment, complaint investigations, control measures, sanitation, building design, enforcement criteria, and case studies.

**ENVH 578. Principles of Occupational Health. 3 Units.**

Issues related to the effects of occupational exposures on health and safety of workers. Principles of preplacement evaluations, biological and environmental monitoring of hazards, surveillance testing, and disease/injury prevention and treatment.

**ENVH 579. Occupational Health Management. 3 Units.**

Planning, implementing, and evaluating health programs in occupational settings. Principles of case management, cost containment, worker evaluation and placement, referrals, and rehabilitation. Current legislation, regulations, and legal issues.

**ENVH 581. Principles of Industrial Hygiene. 3 Units.****ENVH 585. Institutional Environmental Health. 3 Units.**

Biological and chemical methods for identifying and controlling the environmental factors influencing health in institutional sites, hospitals, acute- and extended-care facilities, foster- and day-care sites, correctional institutions, schools, and other related institutions. Includes epidemiology and etiology of hospital-acquired infections and their control.

**ENVH 586. Environmental Health Administration. 3 Units.**

Introduces the administration and management of organizations involved in environmental health within the context of the health-care system. Provides an overview of regulatory and policy issues, applicable statutes, and emerging management systems.

**ENVH 587. Environmental Toxicology. 3 Units.**

Principles and mechanisms of toxicology as applied to environmentally encountered toxic agents. Toxicants of current public health importance and their pathologic effect on representative tissues and organs. Dose-response relationships; hazard and risk assessment; and determination of toxicity of environmental carcinogens, teratogens, mutagens, pesticides, metals, plastics, and organic solvents.

**ENVH 589. Environmental Risk Assessment. 3 Units.**

Principles and methods of risk assessment associated with human exposure to toxic chemicals and other environmental hazards. Quantitative risk-assessment methodologies and approaches. Ecological risk assessment; risk management issues involved in taking appropriate public health action; risk communication, acceptability, and perception; and informational resources.

**ENVH 605. Seminar in Environmental and Occupational Health. 1 Unit.**

Areas of current interest. May be repeated for additional credit.

**ENVH 694. Research. 1-14 Units.**

Independent research on problems currently receiving study in the department. Research program arranged with faculty member(s) involved. Minimum of thirty hours required for each unit of credit. Limited to qualified master's degree students.

**ENVH 696. Directed Study/Special Project. 1-4 Units.**

Individual arrangements for advanced students to study under the guidance of a program faculty member. May include readings, literature reviews, or other special projects. Minimum of thirty hours required for each unit of credit. A maximum of 4 units applicable to any master's degree program.

**ENVH 698. Laboratory. 1-6 Units.**

Individual and/or group arrangements for selected students to participate in a structured laboratory experience in specified areas of environmental health.

**ENVH 699. Applied Research. 2 Units.**

Assignment to private, government, international, or voluntary health agency or other approved organization where practical application of the materials studied on campus is made under the guidance of the department faculty and the organization involved. Research project that includes substantial analysis of data and discussion of results. Written report and oral presentation required.

**ENVH 797. MIP Residency in Environmental Health. 12 Units.**

Individual guided study in operational field practice under faculty supervision. Limited to graduate students in the ENVH Master's International Program (M.P.H./MIP) whose projects have been approved by their committees.

**ENVH 798A. Field Practicum. 6 Units.**

Assignment to private, government, international, or voluntary health agency or other School of Public Health-approved organization in which practical application of the materials studied on campus is made under the guidance of the department faculty and the organization involved. May consist of a research project. May be repeated for additional credit.

**ENVH 798B. Field Practicum. 12 Units.**

Assignment to private, government, international, or voluntary health agency or other School of Public Health-approved organization in which practical application of the materials studied on campus is made under the guidance of the department faculty and the organization involved. May consist of a research project. May be repeated for additional credit.