

Berkeley



School of
Public Health

ENVIRONMENTAL HEALTH SCIENCES DIVISION

Academic Year: 2016-17

STUDENT HANDBOOK

Academic Degrees: MS, MS/Ph.D. and Ph.D.

This Handbook is for students enrolled in the EHS Graduate Group. It addresses the policies and procedures relating to the academic degree programs (MS, joint MS/Ph.D. and Ph.D.). Students enrolled in the professional degrees (MPH, Dr.PH) in the School of Public Health, Division of Environmental Health Sciences, should refer to the appropriate Division and School handbooks for relevant information.

Division of Environmental Health Sciences
50 University Hall, Berkeley, CA 94720-7360

August 22, 2016

Dear Environmental Health Sciences Incoming Class,

Welcome to the Environmental Health Sciences (EHS) Program at the School of Public Health at the University of California at Berkeley!

We are pleased that you decided to pursue your graduate studies here and look forward to interacting with you both in the classroom and through the many field studies and extracurricular activities that await you.

The EHS program has dedicated faculty and staff, and we encourage you to get to know them so that you fully benefit from your time at Berkeley. Each of you has been assigned an academic advisor who will help to guide you during your time in the program. You are also encouraged to reach out to consult with other faculty or staff members who you think may have insight.

There are many resources at your disposal, including the EHS, School of Public Health (SPH) and UC Berkeley websites, SPH Student Services and Admissions staff, and the Center for Occupational and Environmental Health (COEH), which is housed within the Division of EHS. Within the EHS Academic Program Handbook you will find information on:

- EHS mission and competencies
- MS and Ph.D. curricula
- EHS courses
- Program, school, and campus resources

Please read your program handbook and ask faculty or staff any questions that you may have about the program. Norma Firestone is the Student affairs Officer for EHS. Her email is nstone@berkeley.edu and her office phone number is 510 643-5160.

We look forward to getting to know each of you and understanding how we can help you achieve your educational and professional goals in the field of EHS.

With best wishes,



S. Katharine Hammond
Professor and
EHS Graduate Group Advisor: Co-Chair
Division of Environmental
Health Sciences



Kirk R. Smith
Professor and
EHS Graduate Group Advisor: Co-Chair
Division of Environmental
Health Sciences

Table of Contents

1. EHS EDUCATIONAL Competencies.....	5
1.1 Competencies of the MS Program	5
1.2 Competencies of the Ph.D. Program	5
EHS MISSION.....	5
2. INTRODUCTION	6
2.1 Disciplines of Environmental Health Sciences	6
2.2 Administrative Structure.....	7
2.3 Faculty Memberships in the EHS Graduate Group and the EHS Division	8
2.4 Affiliated Programs and Organizations.....	8
3. EHS FACULTY AND RESEARCH INTERESTS.....	9
3.1 Core Faculty in the EHS Graduate Group	9
3.2 Other Members of the EHS Graduate Group	13
3.3 Faculty Advisers	14
4. REQUIREMENTS FOR THE MS DEGREE	14
4.1 Requirements for the Regular MS Program (non-GHE Students)	14
4.1.1 Required Courses.....	14
4.1.2 Recommended Advanced and Elective EHS Courses	15
4.1.3 MS Options for Theses and Projects (non-GHE students).....	15
4.1.3.1 Plan I (Thesis option).....	16
4.1.3.2 Plan II (Non-thesis option)	16
4.1.4 MS Sample Curriculum (non-GHE students)	17
4.2 Requirements for MS students in the GHE Program	17
4.2.1 GHE course requirements and electives	18
5. REQUIREMENTS FOR THE MS/Ph.D. PROGRAM.....	19
6. REQUIREMENTS FOR THE Ph.D. PROGRAM	19
6.1 Course and GSI Requirements.....	19
6.2 Ph.D. Examinations	20
6.2.1 EHS Graduate Group Preliminary Examination	20
6.2.2 Ph.D. Qualifying Examination	21
6.2.3 Advancement to Candidacy	21
6.3 Dissertation	22
6.3.1 The Dissertation Committee	22
6.3.2 Writing and Filing the Dissertation	22
6.3.3 Filing Fee Status.....	22
6.3.4 June Graduation.....	23
7. ACADEMIC PLANNING, POLICIES AND PROCEDURES.....	23
7.1 Forms and Paperwork.....	23
7.2 Course Loads.....	23
7.3 Grade Requirements, S/U Grading, and Incomplete Grades.....	23
7.4 Applying to the Ph.D. Program at the End of the MS Program	24
7.5 Registration and Enrollment in Classes	24
7.5.1 CalCentral	24
7.5.2 Late Registration and Enrollment	24
7.5.3 International Students who Register and Enroll Late.....	24
7.5.4 Adding and Dropping Classes.....	24
7.6 Health Insurance	25
8. FINANCIAL SUPPORT.....	25
8.1 Availability of Financial Support	25

8.2 Taxable Income	25
8.3 Nonresidents of California	26
9. COMMUNICATIONS.....	27
9.1 Mailboxes	27
9.2 Bulletin Boards.....	27
9.3 Computers	27
9.4 E-mail.....	27
9.5 bCourses	28
9.6 Student Participation in Committees	28
10. MISCELLANEOUS	28
10.1 Establishing California Residency	28
10.2 Human Subjects Protection.....	28
10.3 Supplies and Expenses	29
Appendix A. EHS Preliminary Graduate Group Examination.....	29
A.1 Introduction	29
A.2 Purpose of the EHS Preliminary Graduate Group Examination	30
A.3 Written Component of the EHS Preliminary Graduate Group Examination	30
A.3.1 Format of the written component of the Preliminary EHS Graduate Group Examination.....	30
A.4 Oral Component of the EHS Preliminary Graduate Group Examination	31
A.5 Pass/Failure of the EHS Preliminary Graduate Group Examination	31
Appendix B. Ph.D. Qualifying Examination	31
B.1 Purpose of the Qualifying Examination.....	31
B.2 Qualifying Examination Committee	32
B.3 Format and Conduct of the Qualifying Examination.....	32
B.4 Outcome of the Qualifying Examination.....	32
Appendix C. The Ph.D. Dissertation	33
C.1 Dissertation Process.....	33
C.2 Dissertation Committee	33
C.3 Research Involving Human or Animal Subjects	33
C.4 What Students Should Know Before Filing a Dissertation.....	33
C.5 Dissertation Colloquium.....	34

1. EHS EDUCATIONAL Competencies

The EHS program promotes understanding of the human health impacts of physical, biological, and chemical agents, and explores the means to assess and control exposures to hazardous substances in the general environment and the workplace.

1.1 Competencies of the MS Program

The MS program emphasizes interdisciplinary training in EHS. Upon completion of the program, MS graduates will be prepared to:

- a) Describe how chemical agents are tested for acute, sub-chronic and chronic health effects, including reproductive, developmental and carcinogenic effects, and interpret toxicological data in terms of relevance to human health.
- b) Describe how humans are exposed to chemical, physical, and biological agents in the workplace and the general environment.
- c) Describe how exposures are quantitatively assessed and controlled through administrative procedures, personal protective equipment, and engineering technologies.
- d) Utilize epidemiological data to assess the nature and degree of impact of hazardous agents on the health of human populations.
- e) Analyze risk management decisions, demonstrating the scientific components of risk assessment and the policy context in which risk management decisions are made.
- f) Identify areas of uncertainty in the exposure and risk assessment processes.
- g) Identify significant gaps in the current knowledge base concerning health effects of environmental agents.
- h) Identify the most important disease burdens and their major environmental risk factors.
- i) Describe current legislation and regulation regarding environmental health issues.
- j) Develop and conduct research projects.
- k) Organize information and data, prepare technical reports and give oral presentations on environmental contaminants and their impacts on human health

1.2 Competencies of the Ph.D. Program

The Ph.D. program is designed to prepare students for careers as independent researchers and educators in the field of EHS or one of its subspecialties. Each program is individualized according to the student's background and research interest. Emphasis is placed on the development and formulation of research hypotheses and a significant original contribution to knowledge. In addition to meeting the competencies of the MS program noted in section 3.1, Ph.D. graduates will be able to:

- a) Clarify critical gaps in scientific knowledge regarding environmental health problems.
- b) Conceive, develop and conduct original research in EHS or one of its disciplines.
- c) Develop and demonstrate written and oral communications skills by publishing scientific papers and presenting papers at meetings, symposia and other venues.
- d) Demonstrate competence in university-level teaching of EHS.

EHS MISSION

The mission of the Environmental Health Sciences (EHS) program is to prepare students to assess the health impacts of physical, chemical, and biological agents in the environment and workplace and to explore means for their measurement and control. EHS integrates several disciplines with emphasis in assessment of exposures to environmental contaminants, toxicology, environmental and occupational epidemiology, risk assessment, and policy analysis. Students learn to apply tools in these disciplines to problems in the United States and other parts of the world.

2. INTRODUCTION

Environmental factors are estimated to be responsible for 25-40% of the burden of human ill-health around the world and seriously affect the most vulnerable members of society, such as young children, pregnant women, and the poor. The Environmental Health Sciences (EHS) curriculum prepares students to assess the health impacts of physical, chemical, and biological agents in the environment and to explore means to quantify and control exposures. Specialty areas within EHS include exposure assessment, toxicology, environmental and occupational epidemiology, industrial hygiene, the global health and environment (GHE) program, ergonomics, and environmental health policy. These areas of emphasis are described below.

2.1 Disciplines of Environmental Health Sciences

Environmental Health Sciences is a multi-disciplinary field that brings together knowledge and tools from several areas to build capacity to understand and address environmental health issues. As you are probably aware, environmental factors are estimated to be responsible for 25-40% of the burden of disease. There are also issues of equality as some groups are more affected and more susceptible including infants and children, pregnant women, and people with less money and power.

The EHS curriculum prepares students to assess the health impacts of physical, chemical, and biological agents in the environment and workplace, and the means for their measurement and control. EHS integrates several disciplines with emphasis on assessment of exposures to environmental contaminants, toxicology, environmental and occupational epidemiology, risk assessment, control strategies, and policy solutions. Students learn to apply tools in these disciplines to problems in both the U.S. and other parts of the world. Some of the disciplines are discussed below.

Toxicology - Measurement of dose-response relationships for environmental chemicals; investigations of mechanisms of toxicity; application of bioassays for evaluating chemical toxicity; development of biological markers of chemical exposure and effect.

Exposure Assessment - Evaluation of exposures including the design and development of measurement techniques or strategies; air and water pollution studies including design of control strategies; studies of sources of pollution and their relationship to human health.

Environmental Health Policy - Draws upon assessment methods including risk assessment, to focus on strategies to prevent exposures to environmental and occupational hazards and conditions, with an emphasis on communication strategies for diverse audiences and consideration of equity.

Occupational and Environmental Epidemiology - Involves human population studies that address the health effects caused by exposure to chemical and physical agents. Although Occupational and Environmental Epidemiology is one of the core areas in EHS, students whose primary interest is epidemiology would usually apply for admission to the Division of Epidemiology. While based in that Division, students may enroll in EHS courses and work with faculty in both divisions.

Industrial Hygiene - Recognition of health risk caused by exposure to toxic chemicals, harmful physical or infectious biological agents and ergonomic factors, evaluation of exposures by various measurement techniques or strategies involving worksite air sampling and biological monitoring, formulation of controls for exposures by administrative, engineering, or personal protective measures.

Ergonomics - Recognition and amelioration of work-related risk factors for chronic musculoskeletal disorders through knowledge of pathophysiology, biomechanics, anthropometry, and engineering. The goal of Ergonomics is to improve design of workstations to prevent injury.

The Global Health and Environment Program (GHE) - is a unique, interdisciplinary, campus-wide Master of Science program to train students to undertake careers directed toward improving the lives of people in developing countries through understanding the environmental risk factors that affect their health and how to reduce the impact of these factors. In addition to studying traditional environmental risk factors, such as water and air pollution, students will learn about large-scale and emerging environmental risks, such as climate change.

GHE takes advantage of the wide diversity of teaching and research on the Berkeley campus by encouraging students to take courses across the range of disciplines that contribute to its main objective: improving health in the poorest societies and enhancing the sustainability of global development, poverty alleviation, public health, environmental protection and energy use systems.

2.2 Administrative Structure

The academic degrees (MS, joint MS/Ph.D., and Ph.D.) are granted by the Berkeley Graduate Division through the EHS Graduate Group. (A Graduate Group is a multi-disciplinary academic unit comprised of faculty members from more than one department who have common interests and expertise in an area of study that cuts across disciplinary lines. The EHS Graduate Group is comprised of faculty from several Divisions of the SPH, the College of Engineering, and the College of Natural Resources. Section 2.3 lists current members of the EHS Graduate Group.) Students in the EHS MS and Ph.D. programs are primarily interested in performing original research.

A source of confusion is the fact that EHS is the name of both the Berkeley Graduate Group and one of the divisions in the School of Public Health (SPH). While the EHS Graduate Group is responsible for the academic degree programs (MS, MS/Ph.D. and Ph.D.), the EHS Division of the SPH is responsible for the professional degree programs (MPH and Dr.PH). Although students in the MS, MS/Ph.D. and Ph.D. programs are officially associated with the EHS Graduate Group for administrative purposes they are regarded as being enrolled in the SPH and many administrative matters are handled through the SPH.

Academic matters affecting MS and Ph.D. students must be approved by Dr. Kirk Smith, or S. Katharine Hammond, Chair and the Head Adviser of the EHS Graduate Group, who, in this capacity, reports to **Fiona M. Doyle**, Dean of the Graduate Division. The professional degrees in EHS (MPH and Dr.PH), are under the jurisdiction of the Dean of the SPH, Dr. Stefano Bertozzi. Dr. Ellen Eisen serves as Division Head, and Dr. John Balmes serves as the Vice Head of the EHS Division and represent EHS faculty within the SPH. Students in both the academic and professional degree programs have faculty advisers based on their specialty areas within EHS.

All paperwork required for MS, MS/Ph.D. and Ph.D. students in EHS is handled through the EHS Program Coordinator, Norma Firestone, at 761 University Hall. Ms. Firestone is the student's primary resource for dealing with administrative needs, forms, degree requirements, etc.

2.3 Faculty Memberships in the EHS Graduate Group and the EHS Division

MS and Ph.D. students should choose an advisor from the EHS Graduate Group. Some EHS faculty are members of the EHS Graduate Group; some are members of the EHS Division of the SPH; and some are members of both the EHS Graduate Group and EHS Division. The table below shows the current membership of the EHS Graduate Group and EHS Division. Members of the EHS Graduate Group include both Berkeley senate faculty members and those adjunct faculty members (shown with ‘*’) who have been granted blanket approval by the Graduate Division to serve as co-chairs of dissertation committees and as inside members of dissertation and qualifying examination committees.

Faculty name	Member of the EHS Graduate Group	Member of the EHS Division
Dr. John Balmes	Yes	Yes
Dr. Michael Bates	Yes*	Yes
Dr. John Casida	Yes	No
Dr. Ellen A. Eisen	Yes	Yes
Dr. Brenda Eskenazi	Yes	No
Dr. Katharine Hammond	Yes	Yes
Dr. Nina Holland	Yes*	Yes
Dr. Catherine Koshland	Yes	Yes
Dr. Thomas McKone	Yes	Yes
Dr. Rachel Morello-Frosch	Yes	No
Dr. William Nazaroff	Yes	No
Dr. Stephen Rappaport	Yes	Yes
Dr. David Rempel (emeritus)	Yes	No
Dr. James Robinson	Yes	No
Dr. Kirk Smith	Yes	Yes
Dr. Martyn Smith	Yes	Yes
Dr. Robert Spear (emeritus)	Yes	Yes
Dr. Luoping Zhang	No	Yes
Dr. Asa Bradman	No	Yes

*Can serve as co-chair of dissertation committees and as inside member of dissertation and qualifying examination committees.

2.4 Affiliated Programs and Organizations

The EHS Division is affiliated with the Northern California Center for Occupational and Environmental Health (COEH) which links the EHS program with clinically oriented programs at the UC Davis and UC San Francisco campuses. The COEH is also an Educational Resource Center of the National Institute for Occupational Safety and Health (NIOSH), which provides student support at Berkeley in the areas of industrial hygiene and ergonomics. Additionally, the COEH sponsors community outreach to labor groups through the Labor Occupational Health Program (LOHP) and the Berkeley Initiative on Green Chemistry.

3. EHS FACULTY AND RESEARCH INTERESTS

3.1 Core Faculty in the EHS Graduate Group

John Balmes, M.D.

Professor and Vice Head of the EHS Division; Director, Northern California COEH, (Academic Senate). Dr. Balmes is a pulmonary physician, Professor of Medicine at UCSF, and Professor of Environmental Health, SPH. His research is principally in the area of occupational and environmental respiratory disease. He studies the acute effects of inhalational exposures to ambient air pollutants in his Human Exposure Laboratory at San Francisco General Hospital and the chronic effects of such exposures in epidemiological studies with collaborators at both UCSF and UC Berkeley. Two examples of his current UCB-based work are a study of the effects of air pollution on risks of obesity and diabetes in a cohort of children from Fresno and a study of the effects of exposure to biomass smoke in Malawi on risks of early childhood pneumonia and decreased lung function in adults. He is also interested in genetic and epigenetic determinants of responses to air pollutants.

Michael N. Bates, Ph.D.

Professor of Environmental Epidemiology (Non-Academic Senate). Dr. Bates is an occupational and environmental epidemiologist with a background in toxicology. Current research includes a large cross-sectional study in New Zealand investigating whether chronic exposure to hydrogen sulfide gas from geothermal sources is associated with health effects, a study of the health effects of solvent exposures in San Francisco Bay Area automotive mechanics, and investigations in India and Nepal into whether indoor smoke from cooking fires increases risks for tuberculosis and cataract of the eye. Other recent research projects have included epidemiologic studies in Argentina and Chile investigating cancer risks from arsenic in drinking water, studies of cancer risks for firefighters and possible health effects of dental amalgam fillings, and studies of organochlorine contaminants in breast milk and serum. Dr. Bates is also Associate Director of the Global Health and Environment (GHE) Program within the Division of EHS and he teaches the summer class Epidemiologic Methods I (PH 250A).

Asa Bradman, Ph.D., MS

(Lecturer, Division of EHS, SPH). Dr. Bradman is an environmental health scientist who focuses on exposures to pregnant women and children. He worked with Dr. Eskenazi to co-found CERCH in 1997 and helps direct biomonitoring and exposure studies as part of the CHAMACOS partnership in the Salinas Valley, California. He is co-Principal Investigator of the National Children's study in Kern County, CA, and also leads an initiative to improve environmental health in California child care facilities. He was appointed by Governor Schwarzenegger to the Scientific Guidance Panel for the California Environmental Contaminant Biomonitoring Program and is a member of the Scientific Advisory Committee of the National Center for Healthy Homes and the California Child Care Health Program Advisory Panel.

Ellen A. Eisen, Sc.D.

Professor of Environmental Epidemiology, Head of EHS Division (Academic Senate). Dr. Eisen does research at the interface of epidemiologic methods and applied public health, and bridges the fields of occupational and environmental health, statistics and epidemiology. A long-term interest in selection bias due to the healthy worker survivor effect has motivated much of her work. In early studies of the physiologic significance of poorly reproducible pulmonary function tests, she identified excess FEV1 test variability (poor reproducibility) as a biomarker of impaired respiratory health and a source of selection bias in epidemiologic studies. In later studies of health effects of metalworking fluids in the automobile industry, she developed a strategy for reducing healthy worker survivor bias due to job transfer in cross-sectional studies, leading to an association between adult onset asthma and exposure to water-based fluids. Her ongoing studies of cancer in a large cohort of autoworkers have identified new associations between exposure to oil based fluids and cancers of the larynx, rectum, and bladder, as well as malignant melanoma. She is interested in nonparametric models of

relative risk as a smoothed function of exposure because these methods can capture nonlinearities that frequently arise in occupational studies due to depletion of more susceptible subjects or healthy worker survivor bias. She is currently applying causal models to address healthy worker survivor bias as a problem related to the treatment of a time varying confounder (underlying health status) that is affected by previous exposure. In addition to the cancer incidence and mortality studies of autoworkers, Dr. Eisen is involved in exposure-response models of pulmonary function and cancer in longitudinal studies of cotton textile workers, cardiovascular disease in aluminum workers, and carpal tunnel in manufacturing workers.

S. Katharine Hammond, Ph.D.

Professor (Academic Senate). Dr. Hammond's early work focused on the pulmonary effects of exposures to silicon carbide in manufacturing, the carcinogenic potential of diesel exhaust exposures in railroad workers, the effects of exposure to solvents among boat builders, and the effect of exposure to machining fluids in the automobile industry. One of her continuing interests has been quantifying exposures to environmental tobacco smoke (ETS). She developed one of the first methods for measuring such exposure quantitatively as well as the first passive monitor for ETS exposure. Her work on two major studies of ETS exposure on commercial airlines led to the banning of cigarette smoking on domestic flights. The measuring techniques she developed have been adapted by the U.S. Environmental Protection Agency for its nationwide study of exposures. Dr. Hammond directed the exposure assessment strategy for the large and complex study of spontaneous abortion among women in the semiconductor industry. The study sought to learn if there was an excess risk of miscarriages among women working in fabrication facilities and, if so, what the cause might be. Ultimately, the study showed that fabrication employees did have an increased incidence of spontaneous abortion, and Dr. Hammond's exposure assessment procedures enabled the team to identify positive photo resists and a product called "buffered oxide etch" as being associated with particularly elevated risks. Dr. Hammond plans to continue developing innovative methods of exposure assessment for environmental and occupational health.

Carissa Harris-Adamson, Ph.D., CPE

Dr. Harris is Assistant Professor of Environmental Health in the School of Public Health at UC Berkeley and Assistant Professor in the Department of Medicine at UC San Francisco. Additionally, she is the Director of the Ergonomics Research & Graduate Training Program. Her research is primarily focused on the prevention of musculoskeletal disorders such as carpal tunnel syndrome and hand/wrist tendinitis. She is engaged in epidemiological research to identify the biomechanical and psychosocial exposures associated with upper extremity MSDs and subsequent work disability. Additionally, Dr. Harris collaborates with other EHS Faculty and students to study the health impacts of heavy load carrying (water, firewood, etc) on women in third world countries. She is engaged in prevention through design research that aims to reduce workplace biomechanical exposure through equipment and work design modifications. Currently, Dr. Harris is also researching the physiological impact of heavy and sedentary workloads on workers' health.

Nina T. Holland, Ph.D.

Professor, (Non-Academic Senate). Director of Children's Environmental Health Laboratory, and SPH Biorepository at UC Berkeley). Dr. Holland's scientific interests include human genetics, molecular epidemiology and reproductive toxicology. Currently, Dr. Holland conducts several projects focused on effects of air pollution, pesticides and other environmental agents on growth, neurodevelopment, cytogenetic and immunological abnormalities in fetuses, young children and adolescents, and on genetic and epigenetic mechanisms. She participates in several collaborative projects including CERCH, FACES, CRECE (<http://cerch.org/research-programs>) at UC Berkeley, and with Stanford University, Children's Hospital Oakland Research Institute, Kaiser Research Center and University of California, San Francisco. She has organized scientific sessions on Molecular Epidemiology of Children's Environmental Health and has been an invited speaker at numerous national and international meetings. She is a principal instructor on the graduate courses "Molecular and Genetic Epidemiology" at UC Berkeley. She has also taught and provided research assistance at the University of Hawaii, and the National Universities of Australia, Mexico, Thailand and India.

Catherine P. Koshland, Ph.D.

Professor of EHS, SPH; Professor, Energy and Resources Group; Wood-Calvert Professor in Engineering (Academic Senate). Vice Chancellor for Undergraduate Education. Dr. Koshland's research and teaching are at the intersection of air pollution, combustion, energy and public health. She works with graduate students in Mechanical Engineering and Civil Engineering as well as in Public Health and Energy and Resources. Her primary research has been focused on the analysis of pollutant formation in combustion processes including the study of fundamental chemical kinetic mechanisms for chlorinated hydrocarbons, and the development of advanced diagnostic tools for non-intrusive monitoring of combustion species including CHCs and metals. Recent work has focused on nano-particles including their formation, chemical characteristics and health impacts, and on their use in sensors for detection of toxic substances. In addition, she has worked with a number of students in energy (combustion), air pollution and environmental (human) health assessing the impacts of changes in technologies or the built environment, or environmental or technology policies on the health and well-being of communities in the US and China.

Thomas E. McKone, Ph.D.

Professor (Non-Academic Senate) Emeritus. Dr. McKone's research interests include the use of multimedia compartment models in health-risk assessments; chemical transport and transformation in the environment; and measuring and modeling the biophysics of contaminant transport from the environment into the microenvironments with which humans have contact and across the human/environment exchange boundaries--skin, lungs, and gut. His most recent achievement in the area of exposure assessment involves the development of the CalTOX model for the California Department of Toxic Substances Control. This model addresses clean-up goals for contaminated soils and the contamination of adjacent air, surface water, sediments, and ground water. The modeling effort includes multimedia transport and transformation models, exposure-scenario models, and efforts to quantify and reduce uncertainty in multimedia, multiple-pathway exposure models. The model is now being distributed by Cal-EPA and has attracted much attention both in the academic and regulatory communities. Dr. McKone is now working with the U.S. EPA to develop exposure models for regional air pollution and to develop exposure models for use with industrial ecology studies. He is also working with the U.S. EPA, the National Academy of Science, and the Environmental Defense Fund to evaluate health impacts of industrial releases to the air, water, and soil, and to assess the reliability of models used as indicators of health and environmental impact.

Stephen M. Rappaport, Ph.D.

Professor (Academic Senate). Dr. Rappaport is a prominent advocate for the concept of the 'exposome', which represents all potentially important exposures from both exogenous and endogenous sources received by a person during life. Much of his current research involves exposome-wide association studies that compare profiles of chemicals in blood from diseased and healthy persons to discover exposures that cause cancers and other chronic diseases. He is also a pioneer in the field of exposure biology, which employs a combination of environmental and biological measurements - along with statistical models - to investigate the uptake, elimination, metabolism and mechanisms of damage caused by toxic chemicals. He has long-term interests in areas related to the assessment of long-term chemical exposures for purposes of controlling workplace hazards and investigating exposure-response relationship

Justin Remais, Ph.D., M.S.

Associate Professor (Academic Senate). Dr. Remais' research advances methods for estimating the distribution and spread of environmentally-mediated infectious diseases in rapidly changing environments. His work has examined the public health implications of a wide range of major environmental changes, such as those resulting from urbanization, industrialization, changes in water resources, and a changing and more variable climate. Dr. Remais' NIH- and NSF-funded research in China has involved the analysis of high-dimensional disease surveillance, climate and geospatial data to characterize the dynamics of waterborne and vector-borne infections—including diarrheal diseases, malaria, dengue, Japanese encephalitis and schistosomiasis—as the country has experienced

significant societal and environmental changes. He currently serves as a Principal Investigator of projects working in Ecuador and Senegal to address fundamental questions regarding how infectious diseases spread along environmental pathways, and what can be done to interrupt their transmission. His research in these settings focuses on diarrheal and parasitic diseases, combining field research, epidemiological analysis and simulation modeling to identify the optimal timing and targeting of control and surveillance activities. Prior to joining the UC Berkeley faculty, Dr. Remais served on the faculty of Emory University and the Georgia Institute of Technology.

Kirk R. Smith, Ph.D., MPH

Professor of Global Environmental Health, SPH; Coordinator of Global Health and Environment MS Program. Dr. Smith's research focuses on environmental and health issues in developing countries, particularly those related to health-damaging and climate-changing air pollution from household energy use, and includes field measurement and health-effects studies in India, China, Nepal, Mexico, and Guatemala as well as development and application of tools for international policy assessments. He also develops and deploys small, smart, and cheap microchip-based monitors for use in these settings. He is working with groups in Guatemala and India to conduct large-scale epidemiological studies of the health impacts in women and children of smoke from household use of solid fuels, a large source of exposure on a global scale. In the course of this work, he has developed new conceptual approaches to total exposure assessment and its use in regulatory policy. He also conducts research on greenhouse gas emissions in developing countries, again both at the level of field monitoring and new concept development. He explores the potential co-benefits that can be attained by choosing international greenhouse-gas control efforts according to their potential to reduce health-damaging pollutants. He sits on several international policy bodies, including the Global Energy Assessment, the Global Comparative Risk Assessment, the Intergovernmental Panel on Climate Change, and WHO's Indoor and Outdoor Air Quality Guidelines. He is a member of the US National Academy of Sciences.

Martyn T. Smith, Ph.D.

Professor of Toxicology, Program Director, Superfund Basic Research Program (Academic Senate). Research in Dr. Smith's laboratory aims to find the causes of blood cancers (leukemia & lymphoma) in adults and children and to develop new therapies for their treatment. To achieve this goal his research group is developing biomarkers that will allow identification of persons at risk of leukemia and lymphoma and are examining the effects of chemicals linked with these diseases, such as benzene, formaldehyde and chlorinated solvents, in molecular epidemiology studies of exposed human populations. Studies on the basic biology of these diseases in cell culture aim to understand the role of stem cells, chromosome abnormalities, epigenetic changes, and immunological dysfunction in the development of these diseases.

Robert C. Spear, Ph.D.

Professor, Emeritus. Dr. Spear is an engineer by training. His research is principally in the area of exposure assessment and in the modeling and analysis of environmental and occupational health problems. From his early work on pesticide exposure in farm workers to more recent work in the analysis of risk arising from exposure to water contaminated with pathogenic micro-organisms, his focus has been on the understanding of the impact of uncertainty and variability in these processes and how they affect intervention and control strategies. In recent years his work has been focused on understanding the local determinants of the transmission intensity of the parasitic disease, schistosomiasis, and in developing local control strategies. This work is currently being extended to a related parasitic disease in Thailand involving human exposure and infection via consumption of uncooked fish. This new area is also being tackled using geographical information system technology, satellite imaging, and dynamic systems approaches developed in his former work.

Luoping Zhang, Ph.D.

Professor (Non-Academic Senate). Most of Dr. Zhang's research projects are focused on the biological consequences of chemical exposures in humans and understanding the molecular mechanisms involved. For the past two decades, Dr. Zhang, in collaboration with many national and international scientists, has lead and conducted numerous molecular epidemiological studies that used biomarkers of occupational and/or

environmental exposures to toxic chemicals, including benzene, butadiene, formaldehyde, and trichloroethylene in China; dioxin in Italy; and arsenic in Chile and Bangladesh. Dr. Zhang has been a co-leader and co-principle investigator in the Superfund Research Program and the Center for Exposure Biology at Berkeley. Her group employs and develops many high-throughput novel technologies, such as, molecular cytogenetics (OctoChrome FISH, fluorescence *in situ* hybridization), single-cell genetic analysis, and omic-based technologies, such as toxicogenomics (the toxicity testing in 21st Century) to further understand the causes and mechanisms of leukemia and lymphoma associated with exposure to environmental pollutants. Most recently, her research interest has turned to functional genomics by applying RNAi (RNA interference) and novel CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) techniques in human cell culture studies of toxic chemical exposure. Additionally, Dr. Zhang has been appointed as a member of *Carcinogen Identification Committee* by California Governor Brown since 2012. She also served as a member on various committees for Institute of Medicine at the National Academies. Dr. Zhang teaches “*Practical Toxicology*” (PH 270C), a unique and real-world toxicology course.

3.2 Other Members of the EHS Graduate Group

John Casida, Ph.D.

Professor of the Graduate School and of Molecular Toxicology, College of Natural Resources. Dr. Casida’s overall research goal is to provide information pertinent to the safer and more efficient use of existing agrochemicals and the development of new materials with better selectivity characteristics and environmental compatibility. Two general approaches are used in this research: 1) evaluate the chemistry, metabolism, and mode of action of insecticides, herbicides, fungicides, related toxicants, and environmental chemicals; 2) consider structure-activity relationships, photoalteration and persistence characteristics, metabolic fate and biodegradability, primary modes of action and secondary toxicological lesions.

Brenda Eskenazi, Ph.D.

Jennifer and Brian Maxwell Professor of Maternal and Child Health and Epidemiology, Division of Epidemiology, SPH. Dr. Eskenazi’s research is focused on effects of chemical exposure on reproductive and developmental health. She is the Director of the Center of Children’s Environmental Health Research (CHAMACOS) funded by the NIH and EPA and also leads CERCH (Center for Environmental Research & Children’s Health) at UC Berkeley. This Center investigates the exposure and potential health effects of pesticides and other environmental agents on pregnant women and children living in the agricultural community of the Salinas Valley and other parts of the world. She has written extensively about the reproductive and developmental effects of passive and active exposure to cigarette smoke on fetal and child growth and neurodevelopment as well as the reproductive and developmental effects of caffeine exposure. She has used the alpha fetal protein as a biomarker of exposure in analyzing the reproductive health effects of caffeine. She has studied the reproductive health of women employed in the semiconductor industry and plans to continue studying the reproductive health effects of women in the maquiladora industries on the U.S. Mexico border. She has also been interested in the epidemiology of preeclampsia, a hypertensive disease of pregnancy, and has demonstrated an association of solvent exposure and hypertension and preeclampsia. Recently, Dr. Eskenazi has been examining the reproductive health of a population of women heavily exposed to dioxin from an explosion in 1976. Specifically, she is determining whether dioxin exposure causes higher rates of endometriosis. She is also interested in the hazards of chemical exposure on male reproduction. As one of the Superfund project investigators, she is using genetic biomarkers of human sperm to assess the effects of paternal exposure to environmental toxicants on the fetus.

Rachel Morello-Frosch, Ph.D.

Professor, Dept. of Environmental Science Policy and Management, and SPH. Dr. Morello- Frosch’s research examines race and class determinants of environmental health among diverse communities in the United States. Specifically, she is assessing the relationship between social inequality, psychosocial stress and how these factors may interact with chemical exposures to amplify pollution/health outcome relationships and produce environmental health inequalities. Much of her work has examined this question in the context of ambient air

pollution and indoor chemical exposures and children's health, often using community-based participatory research approaches for data collection and risk communication. As part of this work she also explores the scientific challenges and bioethical considerations associated with exposure assessment and chemical biomonitoring research in economically and racially marginalized communities. Dr. Morello-Frosch has also examined ways in which measures of material deprivation (e.g. poverty) and social inequality (e.g. racial residential segregation) may modify observed relationships between pollution exposures and poor perinatal outcomes such as low birth weight and risk of preterm delivery. She is also exploring issues related to community health vulnerability to climate change. In collaboration with scientific colleagues and regulatory scientists, she has worked to develop scientifically valid and transparent tools for assessing the cumulative impacts of chemical and non-chemical stressors to inform regulatory decision-making and environmental policy in ways that advance environmental justice goals and that address the disparate impacts of environmental hazards in vulnerable communities.

William Nazaroff, Ph.D.

Daniel Tellep Distinguished Professor, Department of Civil and Environmental Engineering, College of Engineering. Dr. Nazaroff's research group studies air quality engineering, primarily emphasizing two themes: (1) pollutant dynamics in indoor air and (2) exposure science. On (1), the primary interest is to better understand the physics and chemistry that control the concentrations, fates, and effects of pollutants in indoor environments. On (2), we develop and apply basic knowledge about air pollutants to build a quantitative and mechanistic understanding of the relationship between emissions from sources and consequent human exposures. The group pursues research through a combination of laboratory and field experiments, modeling, and data analysis. In recent years, in addition to maintaining vigorous activities in these two primary areas, Dr. Nazaroff's group has begun to pursue research opportunities on the themes of sustainability, climate change, and energy-use efficiency, especially when opportunities arise that intersect with the primary research emphases.

3.3 Faculty Advisers

Each EHS student has been assigned a faculty adviser according to his or her intended course of study and expressed area of interest. The faculty advisers can be changed by mutual consent. Students are expected to meet with their advisers at the beginning of each semester and are encouraged to do so more often.

4. REQUIREMENTS FOR THE MS DEGREE

Students for the MS degree in EHS are either in the regular MS program or in the Global, Health, and Environment (GHE) program. The requirements for these programs differ as indicated below. For descriptions of courses, see the Berkeley catalogue is online at: <http://schedule.berkeley.edu/>. Current schedules for EHS and other Public Health courses are available at the EHS Program Coordinator's Office.

4.1 Requirements for the Regular MS Program (non-GHE Students)

4.1.1 Required Courses

PH 220C	Health Risk Assessment, Regulation, and Policy (3) (Sp)
PH 250A	Epidemiologic Methods I (3) (F) or PH 250B Epidemiologic Methods II (4) (F)
PH 270	Introduction to Environmental Health Sciences (3) (F)
PH 270A	Exposure Assessment and Control (3) (Sp)
PH 270B	Toxicology (3) (F)

Two biostatistics courses are also required of which the following are generally selected (other courses can be substituted):

PH 142 Introduction to Probability and Statistics in Biology and Public Health (4) (F, Sp)
PH 145 Statistical Analysis of Continuous Outcome Data (4) (F)

4.1.2 Recommended Advanced and Elective EHS Courses

Advanced courses

PH 220 Health Policy Decision Making (3) (F)
PH 256A Human Genome, Environment, and Health (2) (Sp)
PH 256B Genetic Analysis Methods (2) (Sp)
PH 267B Characterization of Airborne Chemicals (3) (Sp, every odd yr)
PH 269C Occupational Biomechanics (3) (Sp)
PH 269D Ergonomics Seminar (2) (F)
PH 269E Current Topics in Environmental Medicine (3) (F)
PH 270C Practical Toxicology (2) (Sp)
PH 271C Drinking Water and Health (3) (Sp)
PH 271D Global Burden of Disease (3) (Sp)
PH 271E Policy for Health and Environment (3) (Sp)
PH 271G Health Implications of Climate Change (2) (Sp)
PH 272B Case Studies in Occupational & Environmental Epidemiology (2) (F)
PH 290 Quantitative Exposure Assessment (3) (F, Sp)
PH 290 Infectious Disease (2) (F)

Other elective courses

City Planning 204C	Introduction to Geographic Information Systems (GIS) and City Planning (4) (Sp)
Energy & Resources 100	Energy and Society (4) (F)
Energy & Resources 102	Quantitative Aspects of Global Environ. Problems (4) (Sp)
Energy & Resources 200	Energy Analysis (4) (F)
ESPM 148	Pesticide Chemistry & Toxicology (3) (Sp, alt. yrs.)
ESPM 160AC	American Environment & Cultural History (4) (F)
ESPM 161	Environmental Philosophy and Ethics (3) (F)
ESPM 167	Environmental Health & Development (3) (Sp)
Civil & Env. Engineering 111	Environmental Engineering (3) (F, Lab offered in Sp)
Civil & Env. Engineering 114	Environmental Microbiology (3) (Sp)
Civil & Env. Engineering 173	Groundwater & Seepage (3) (F)
Civil & Env. Engineering 218A	Air Quality Engineering (3) (F)
Nuclear Engineering 162	Radiation Biophysics and Dosimetry (3) (Sp)
Boalt 271	Environmental Law & Policy (4) (F)
MBA 209F	Fundamentals of Business: An Introduction to Business for Graduate Students (3) (F)

4.1.3 MS Options for Theses and Projects (non-GHE students)

MS students have four semesters in which to complete requirements for their degree and have the option to pursue Degree Plan I (thesis option) or Degree Plan II (non-thesis option) as described below. MS students should discuss the Plan options with their faculty advisers during the first semester of academic residency and a final decision should be made by the end of the first academic year. In addition to the requirement of 8-12 units of advanced study in the major field of EHS (the number of units is determined by the Degree Plan as indicated below), MS students are required to take at least two courses outside the graduate group and, preferably, outside the SPH. The faculty adviser must approve these courses. Research efforts will begin in the second semester of

the first year with Independent Research (PH 299, 2 units) under the supervision of the faculty adviser. During the second year, students will take additional units of PH 299 as they conduct their research projects or theses. Students will be encouraged to pursue their research during the summer between years one and two.

4.1.3.1 Plan I (Thesis option)

This option requires at least 20 semester units of upper division and graduate courses, and a thesis. A minimum of 8 of these units must be in graduate courses (200 series) in EHS. No more than 6 units of the program may be research units (PH 299), unless the EHS graduate adviser requests special permission and the request is approved by the Dean of the Graduate Division. A minimum of two semesters of academic residence is required. Course units are not granted for the thesis.

MS students must have a properly constituted thesis committee of three members, two of whom must be members of the EHS Graduate group (see section 2.3 for a list of faculty in the EHS Graduate Group). If a proposed committee member does not belong to the Academic Senate, the EHS Graduate Adviser must petition the Graduate Division for an exception.

For filing requirements, including information on deadlines, preparing the thesis, registration, and use of human or animal subjects, please see “Instructions for Preparing and Filing Your Thesis or Dissertation” (<http://grad.berkeley.edu/academic-progress/dissertation/#research-protocols>).

4.1.3.2 Plan II (Non-thesis option)

This option requires a minimum of 24 units of upper division and graduate courses. At least 12 of these units must be in graduate courses (200 level) in the student’s major subject. Additionally, no more than 6 units may be research units (PH 299).

MS students under Plan II must complete a Comprehensive Final Examination, which covers the knowledge and skills reasonably expected of a master’s degree recipient in EHS. Under most circumstances the Comprehensive Final Examination takes the form of an original project, such as a literature review or a research paper utilizing pre-existing data. Alternatively, upon request of the student’s faculty adviser and approval of the EHS Graduate Adviser, an oral examination can be used for the Comprehensive Final Examination. In either case, a committee of two EHS Graduate Group Members will conduct the Comprehensive Final Examination (see section 2.3 for a list of members of the EHS Graduate Group).

4.1.4 MS Sample Curriculum (non-GHE students)

First-Year

Fall:	PH 142 Probability & Statistics	3 units
	PH 145 Statistical Analysis of Continuous-Outcome Data	4 units
	PH 270 Introduction to EHS	3 units
	PH 270B Toxicology	3 units
	PH 250A or B Epidemiologic Methods	3/4 units
	Elective	3 units
Spring:	PH 299 Independent Research	2 units
	Electives	3-6 units

Second-Year

Fall:	PH 299 Independent Research	2 units
	Electives	6-9 units
Spring:	PH 220C Risk Assessment, Policy & Toxics Regulations	3 units
	PH 299 Independent Research	2 units
	Electives	10 units

4.2 Requirements for MS students in the GHE Program

Students enrolled in the GHE program are required to take a set of courses covering four core skill areas: EHS, biostatistics and epidemiology, development trends, theory and economics, and policy and risk analysis. Elective courses can be chosen from upper division and graduate courses in the four core areas or in a range of closely related fields including, but not limited to: international health, demography, maternal and child health, urbanization and health cities, nutrition and malnutrition, environmental sciences, environmental engineering, industrial hygiene and occupational health, and energy and resources.

GHE students are required to pursue the MS Plan II (non-thesis option) and have six semesters in which to complete requirements for their degrees. Plan II requires a minimum of 24 units of upper division and graduate courses. At least 12 of these units must be in graduate courses (200 level) in the student's major subject. Additionally, no more than 6 units may be research units (PH 299). GHE students graduating under Plan II will complete an original project, requiring a project report, such as a comprehensive literature review or a research paper utilizing pre-existing data. For students in the GHE program, A minimum of 41 units are to be completed in these core areas, and a total of 44 units are required to complete the program, including the completion of a 3 unit research project seminar.

MS students under Plan II must complete a Comprehensive Final Examination, which covers the knowledge and skills reasonably expected of a master's degree recipient in EHS. Under most circumstances the Comprehensive Final Examination in GHE takes the form of an original project, often using field data taken by the student but sometimes utilizing pre-existing data. A committee of two EHS Graduate Group Members will supervise the Comprehensive Final Examination (see section 2.3 for a list of members of the EHS Graduate Group).

4.2.1 GHE course requirements and electives

(Total of 44 units)

4.2.1.1 Environmental Health Sciences (3 Courses, courses in bold face are required)

PH 270	Introduction to Environmental Health Sciences (first term if possible) (3) (F)
PH 270A	Exposure Assessment and Control I (3) (Sp)
PH260A	Principles of Infectious Disease (4) (F)
or PH270B	or Toxicology I (3) (F)
CRP 204C	Introduction to GIS and City Planning (4) (Sp)

4.2.1.2 Biostatistics and Epidemiology (3 Courses, courses in bold face are required)

PH 142	Introduction to Probability and Statistics in Biology and Public Health (4) (F, Sp)
Or PH141	Introduction to Biostatistics (4), (Su)
PH 250A/B	Epidemiological Methods – I (3) (F, Su) <u>or</u> Epidemiological Methods – II (4) (F)
PH 145	Statistical Analysis of Continuous Outcome Data (4) (F)
PH 241	Statistical Analysis of Categorical Data (4) (Sp)
PH 245	Introduction to Multivariate Statistics (4) (F)

4.2.1.3. Students should take a minimum of 3 courses in either one of the categories: (1) International Development or (2) Environmental Health Policy

International Development

ARE/PP C253	International Economic Development Policy (3) (F)
ARE C251/Econ C270A	Microeconomics of Development (3) (F)
Demography/Econ C275A	Economic Demography (3) (Sp)
CRP 115/Global Poverty and Practice 115	Global Poverty: Challenges and Hopes in the New Millennium (4) (F)
CRP 251	Housing in Developing Countries (3) (F)
Development Studies C100/Geography 112	History of Development and Underdevelopment (4) (Sp)
ERG 275	Water and Development (4) (Sp, even years)
ESPM 169	Governance of Global Production (3) (Sp)
ESPM 260	International Environmental Politics (4) (F)
PH 213A	Family Planning, Population Change and Health (3) (F)
PH 226D	Global Health Economics (3) (F)

Environmental Health Policy

PH 271D	Global Burden of Disease/Comparative Risk Assessment (3) (Sp)
PH 271E	Science and Policy for Environment and Health (3) (Sp)
PH 220C	Health Risk Assessment, Regulation and Policy (3) (Sp)
ERG 102	Quantitative Aspects of Global Environmental Problems (4) (Sp)
PH 235	Impact Evaluation for Health Professionals (3) (F)

4.2.1.4 GHE Project Seminar (3-6 units to be taken during the last semester or during the summer)

PH 299	GHE Project Seminar (3-6) (F, Sp)
--------	-----------------------------------

4.2.1.5 Elective Courses (remaining units to be chosen from upper division or graduate courses in the above areas and from courses in a range of closely related fields, including but not limited to the following)

PH 212D	Global Health Core Course (3) (Sp) [required for the Global Health Specialty Area certificate – not environmentally oriented]
PH 292	International Internship Seminar (1) (F, Sp)
PH 212A	International Maternal & Child Health (2) (F)
PH 256B	Genetic Analysis Methods (2) (Sp)
PH 267B	Characterizations of Airborne Chemicals (3) (Sp, every odd yr)
CE 111	Environmental Engineering (3) (F, Lab offered in Sp)
CRP 256	Healthy Cities (3) (F)
ESPM 167/PH C160	Environmental Health and Development (4) (Sp)
PH 219E	Introduction to Qualitative Methods in Public Health Research (3) (Sp)
PH 205	Program Planning, Development, and Evaluation (3) (Sp)
PH 260B	Principles of Infectious Disease (4) (Sp)
PH 206D	Food and Nutrition Policies and Programs in Developing Countries (3) (Sp, every even yr)
PH 271G	Health Implications of Climate change (2) (Sp)
By petition	Courses for Designated Emphasis in Global Metropolitan Studies http://metrostudies.berkeley.edu/
PH 211	Health and Human Rights (3) (F)
PH 252C	Intervention Trial Design (3) (F)
CRP 220	Urban and Regional Economy (3) (F)
ESPM C234	Green Chemistry: An Interdisciplinary Approach to Sustainability (3) (Sp)
ESPM 290-P009	Biodiversity and Human Health (3) (Sp)
PH 253B	Epidemiology and Control of Infectious Diseases (3) (Sp)
PH 271C	Drinking Water and Health (3) (Sp)

Please note: Courses are subject to change.

5. REQUIREMENTS FOR THE MS/Ph.D. PROGRAM

For students entering the joint MS/Ph.D. program, continuation to the doctoral program is contingent upon superior performance throughout the MS program and completion of an MS thesis (Plan I) or project (Plan II) as described in the “Procedure for Filing your Thesis” on the UC Berkeley Graduate Division website, <http://grad.berkeley.edu/academic-progress/thesis/#procedure-for-filing-your-thesis> . After completion of the MS degree, students in the joint MS/Ph.D. program complete requirements for the Ph.D. program described below.

6. REQUIREMENTS FOR THE Ph.D. PROGRAM

6.1 Course and GSI Requirements

Ph.D. students must complete a minimum of four semesters of academic residence at UC Berkeley. Ph.D. students in EHS are required to take the core courses (or their equivalents) if they have not already done so as MS students, in addition to the doctoral seminar (PH293). The core courses are:

PH 270A	Exposure Assessment I
PH 250B*	Epidemiologic Methods II
PH 241B*	Categorical Biostatistics
PH 220C	Health Risk Assessment, Regulation, and Policy

PH 270B	Toxicology
PH 271E	Science and Policy for Environment and Health
PH 293	EHS Doctoral Seminar

*The Biostatistics and Epidemiology requirement indicating that any 200 level course will satisfy the requirement.

Ph.D. students must not only develop expertise in the major field (EHS) but also in two minor fields, such as biostatistics, epidemiology, environmental law, policy, or molecular and cell biology, which are selected in consultation with the faculty adviser and are appropriate for the student's dissertation topic. Each minor field will typically require the equivalent of three semesters of graduate study (i.e. 200-level courses). In addition, Ph.D. students are required to take the Ph.D. seminar, PH 293, each semester prior to advancement to candidacy (see section 6.2.3) and should carry at least 3 units of independent research (PH 299) in each of the first two semesters and increased units of research in subsequent semesters. These courses, or equivalent, constitute the basis for the Ph.D. examinations (described in section 6.2).

In practice, Ph.D. students take courses during their first three or four semesters in preparation for the examinations. During the first year, each Ph.D. student works closely with his or her faculty adviser to ensure mastery of the material that will be covered in examinations.

Ph.D. students should register for a full course load of 12 units each semester. Students who have completed the necessary coursework should enroll in 12 units of independent research, PH 299. During the entire period of study, a Ph.D. student is required to be in continuous registration, except during those semesters for which the Dean of the Graduate Division has approved a petition for withdrawal, or during the semester when the Filing Fee is used in lieu of registration.

All Ph.D. students are required to serve as a Graduate Student Instructor (GSI) for at least one semester while in residence at Berkeley.

6.2 Ph.D. Examinations

Two examinations are required to complete the requirements for the Ph.D. degree in EHS, namely, the EHS Graduate Group Preliminary Examination and the Qualifying Examination. The student's faculty adviser is not allowed to participate in either examination committee. In addition, a dissertation describing original research must be formally approved by the dissertation committee and filed with the university, as described in section 6.3. Specific faculty committees are selected and approved by the student, the faculty adviser, and the EHS Graduate Group Adviser (in consultation with the Graduate Division of the University).

6.2.1 EHS Graduate Group Preliminary Examination

This preliminary examination normally takes place after 3-4 semesters of course work. It is administered by a committee consisting of three members selected by the student and his or her faculty adviser from the list of members of the EHS Graduate Group and/or Division (see section 1.3 for a list of EHS Graduate Group and Division members). At least two of the faculty members must be a member of the EHS Graduate Group. The examination has both a written and an oral component. The written component takes the form of a NIH-style research proposal covering a topic selected by the student and his or her faculty adviser. The proposal must be submitted to the EHS Graduate Group Committee a minimum of two weeks prior to the oral component of the examination which covers both specific details related to the submitted proposal and general knowledge in EHS. (See Appendix A for details regarding the EHS Graduate Group Preliminary Examination).

6.2.2 Ph.D. Qualifying Examination

The Ph.D. qualifying examination is generally taken a few months after successful completion of the EHS Graduate Group Preliminary Examination. It is administered by a committee consisting of four members. At least two committee members must be members of the EHS Graduate Group (see section 2.3 for a list of EHS Graduate Group members) and at least one committee member must be a member of the Berkeley Academic Senate that is not a member of the EHS Graduate Group. The fourth committee member can, upon approval of the EHS Graduate Adviser and the Graduate Division, be an EHS Division member who is not a member of the EHS Graduate Group (see section 2.3 for a list of EHS Division members). One member of the Qualifying Examination Committee must have expertise in each of the student's two minor areas of study and must certify that the student has demonstrated an acceptable level of competence in the minor area. Students should consult with their faculty advisers and the EHS Group Graduate Adviser to ensure that the Qualifying Examination is properly constituted. Application to take the Qualifying Examination is available at http://grad.berkeley.edu/policies/pdf/qe_application.pdf.

After the Qualifying Examination has been taken, a formal report of the results, signed by all Qualifying Examination committee members, must be sent to the Graduate Division. The EHS Program Coordinator will retain a copy of the report for EHS files and will forward the report to the School and Graduate Division. (See Appendix B for details regarding the Ph.D. Qualifying Examination).

6.2.3 Advancement to Candidacy

When a Ph.D. student has satisfied all requirements and passed the qualifying examination, he or she must complete an application for Advancement to Candidacy (forms are available from the EHS Program Coordinator or from the Graduate Division at (<http://www.grad.berkeley.edu/policies/forms.shtml>)). The student must return the completed application with a check for the candidacy fee (currently \$90) made payable to the Regents of the University of California, to the EHS Program Coordinator to obtain the signature of the EHS Head Graduate Adviser. The EHS Program Coordinator will forward these documents to Graduate Division Degrees office.

The student must also indicate on the form whether human subjects or animal research will be involved in the dissertation research. Human-subjects protocols and/or animal-subjects protocols must be approved by the appropriate Berkeley committees before any dissertation research is conducted (see <http://www.grad.berkeley.edu/policies/guides/research-human-animal>).

Students who have been advanced to candidacy are eligible to apply for the doctoral student support award for research administered by the SPH (contact the EHS Program Coordinator for more information). The tuition of nonresident graduate students, including international students, who have been advanced to Ph.D. candidacy, is reduced to zero for a maximum calendar period of three years calculated from the semester subsequent to the students' advancement, whether registered or not. Any student who continues to be enrolled or who re-enrolls after the three-year period will be charged the full nonresident tuition rate that is in effect at the time.

Doctoral students advanced to candidacy are required to meet annually with at least two committee members (including the dissertation chair) and must complete the online Academic Progress Report, <https://gradlink.berkeley.edu/GLOW/>. Having a positive Academic Progress Report on file from the previous year is required for students in participating programs seeking to use the Doctoral Completion Fellowship. This Annual Review of Doctoral Candidates is part of the Graduate Council's efforts to improve the doctoral completion rate and to shorten the time it takes to obtain a doctorate. The dissertation committee members should comment on the student's progress and objectives also using the online Academic Progress Report, <https://gradlink.berkeley.edu/GLOW/>.

Ph.D. students who have not yet been advanced to candidacy must meet annually with their faculty advisers to discuss progress and plans. The EHS Program Coordinator will distribute the form to be used for this review at the end of each Fall semester.

6.3 Dissertation

(Further details regarding the dissertation research are provided in Appendix C).

6.3.1 The Dissertation Committee

Once a Ph.D. student passes the Qualifying Exam and has advanced to candidacy, he or she formally begins the dissertation process. Ph.D. students in EHS fall under the guidelines of Plan B of the Berkeley Graduate Division which stipulate that a committee of three Berkeley Academic Senate members (or specific non-Senate EHS faculty as indicated above) will guide the research and judge the merits of the dissertation. Two members of the dissertation committee must be members the EHS Graduate Group (section 1.3 lists faculty members in the EHS Graduate Group) and one must be an Academic Senate member who is not in the EHS Graduate Group. If the student's faculty adviser is an EHS Division member who is not in the EHS Graduate Group, then the faculty adviser will serve as the fourth member, and co-chair, of the dissertation committee. Because the EHS faculty adviser is either the chair or co-chair of the dissertation committee, it is important that the Ph.D. student have regular contact with his or her faculty adviser throughout the dissertation research.

6.3.2 Writing and Filing the Dissertation

The dissertation research should comprise sufficient original work to motivate at least three peer-reviewed first-authored publications. Students are strongly urged to submit manuscripts for journal review as each portion of the dissertation research has been completed. Although not a formal requirement, it is generally expected that at least two manuscripts will have been submitted by the time of graduation with the third to be submitted shortly afterwards. Ph.D. students and their faculty advisers should consider manuscripts for peer-reviewed publications to be important milestones in the dissertation process and should use such manuscripts (or equivalent chapters) to judge when the work has matured sufficiently for the dissertation to be filed. For filing requirements, including information on deadlines, preparing the dissertation, and use of human or animal subjects, please see "Instructions for Preparing and Dissertation Writing and Filing" (<http://grad.berkeley.edu/academic-progress/dissertation/>).

Ph.D. degrees are awarded in December, May, August, and all work for the dissertation must be completed by the last day of the respective semester. This is a firm deadline. While students may file their dissertations earlier, the last opportunity to file a dissertation is the last working day of the semester. All members of the dissertation committee must sign the dissertation, and the chair of the dissertation committee also must sign the abstract page.

Doctoral students are required to present their thesis research. This is a celebratory event – not an examination or defense.

Ph.D. students must be registered in order to file the dissertation. Only students on approved Filing Fee status (described in section 6.3.3) are exempt from meeting the registration requirement to file their dissertations.

6.3.3 Filing Fee Status

Ph.D. students who have completed all requirements, except for the filing of their dissertations, can apply for Filing Fee Status (see section 8.3 for further details). EHS Ph.D. students can apply for Filing Fee status only when final approval by the dissertation committee is needed to complete the dissertation. Filing Fee Status may be applied for only once per degree and the fee will not be refunded or transferred because the dissertation has not

been filed with the Graduate Division. Therefore, it is very important that students not submit a Filing Fee application unless they are certain that their dissertations will be filed within the next semester. Applications for filing fee status can be obtained from the EHS Program Coordinator. Applications must be submitted to the SPH Student Services Office and be accompanied by a check for the application fee (currently \$268.50) payable to the Regents of the University of California. The student should provide the EHS Program Coordinator with a copy of the completed filing fee application.

6.3.4 June Graduation

Ph.D. students who have not completed their dissertations may request permission from the EHS Graduate Adviser to participate in the formal graduation ceremony in May, only if the following conditions are met:

- 1) All primary data have been collected and major modeling and/or laboratory experiments have been completed.
- 2) At least two of the three primary chapters of the dissertation have been completed and are under review by the dissertation committee.
- 3) A written statement, signed jointly by the Ph.D. student and his/her faculty adviser, has been given to the EHS Graduate Adviser attesting to (1) and (2) and indicating that the dissertation has a high likelihood of being completed before the next deadline in December.

7. ACADEMIC PLANNING, POLICIES AND PROCEDURES

7.1 Forms and Paperwork

All paperwork required for MS, MS/Ph.D. and Ph.D. students in EHS is handled through the EHS Program Coordinator which is located at 761 University Hall. This includes the filing of schedule request forms, petitioning to add/drop courses, applying to change degree goal, applying to withdraw from the degree program, or applying to graduate.

7.2 Course Loads

EHS students are required each semester to carry a full-time course load, which is equivalent to 12 units. Lower division undergraduate courses (course numbers under 100) are not counted in the calculation of course loads. International students on F-1 or J-1 visas should also enroll in 12 units, but a full program of study for international students is determined by a student's academic program and may consist of fewer units in exceptional circumstances. If there are exceptional circumstances, international students should consult with the Berkeley International Office (BIO, 2299 Piedmont Avenue, 642-2818, <http://internationaloffice.berkeley.edu>) to ensure compliance with the regulations of the Student and Exchange Visitor Information System (SEVIS).

7.3 Grade Requirements, S/U Grading, and Incomplete Grades

In order for students to be in good standing, they must maintain an overall grade-point average of at least 3.0 on the basis of all upper division and graduate courses (100- and 200-level) taken in graduate standing. Grade-points earned in UC Berkeley courses numbered below 100 or above 300 are not included in determining a student's grade-point average.

Although the Graduate Division prefers that students enroll in courses for letter grades, graduate students in good standing may take courses on a Satisfactory/Unsatisfactory (S/U) basis with the consent of their faculty advisers. A Satisfactory grade for graduate students implies work of B- quality or better. It is important for first-year students to take courses on a letter-graded basis in order to establish a grade-point average for future consideration regarding fellowships and academic appointments. Credit for courses taken on an S/U basis is limited to one-third of the total units taken and passed at UC Berkeley (excluding courses PH 291, 297, 299, and 300 through 600 series). The EHS faculty recommends that all EHS core courses, except for the Doctoral Seminars (PH 293/270), be taken for letter grades.

Three or more incomplete grades will result in academic probation, which makes the student ineligible for GSI or GSR appointments. If there are mitigating circumstances that resulted in incomplete grades, such as medically diagnosed illness, the student can request continued enrollment and/or eligibility for student appointments, after consultation with his or her faculty adviser and the EHS Graduate Adviser.

7.4 Applying to the Ph.D. Program at the End of the MS Program

If a current MS student wishes to apply for the Ph.D. program in EHS beginning in the next fall semester, he or she should consult with the EHS Graduate Adviser prior to applying for the Ph.D. degree program. In applying the Ph.D. degree program, the following items must be submitted to the SPH Office of Student Services:

- 1) A new SPH application.
- 2) An updated statement of purpose.
- 3) Three new letters of recommendation.
- 4) A Petition to Add or Change Degree Goal.

7.5 Registration and Enrollment in Classes

7.5.1 CalCentral

Students enroll in classes via CalCentral, which can be accessed online (<https://calcentral.berkeley.edu/>). CalCentral provides up-to-the-minute feedback on the status of registration and class requests.

7.5.2 Late Registration and Enrollment

If students fail to enroll through CalCentral by the end of the third week of instruction, they must file a Petition for Late Enrollment/Registration to enroll in classes. The petition with instructions for submission is available from the Office of the Registrar, 120 Sproul Hall, or from the Registrar's website (<http://registrar.berkeley.edu/GeneralInfo/elecforms.html>).

7.5.3 International Students who Register and Enroll Late

International students in F or J status who fail to enroll in at least one class by the end of the third week of classes must consult with an adviser at the Berkeley International Office (International House, 2299 Piedmont Avenue; 642-2818) as soon as possible. Failure to do so could result in invalidation of the student's immigration status and lead to deportation and ineligibility to reenter the United States. A Petition for Late Enrollment/Registration must also be submitted.

7.5.4 Adding and Dropping Classes

Students may add or drop classes through CalCentral without a fee prior to the third week of instruction. To add or drop a class after the third week of classes, and before the last day of instruction, students must file a Petition to Change Class Schedule. Petitions are available from the Registrar's website

(<http://registrar.berkeley.edu/GeneralInfo/elecforms.html>) and must be endorsed by the EHS Graduate Adviser. To add courses, the student must have the instructor and the EHS Graduate Adviser sign the petition and then file the form in the SPH Office of Student Services. The Graduate Division does not have to approve the petition if it is filed prior to the last day of instruction. Students will automatically be charged a fee for each course added and a fee for each course dropped after the third week of instruction. For deadlines, consult the Registrar's website (<http://registrar.berkeley.edu/Registration/adddrop.html>). Students may also petition to change the grading option for classes.

7.6 Health Insurance

All registered students may use University Health Services (UHS) at the Tang Center for comprehensive outpatient primary care as well as counseling services. Registration fees support much of the care provided at UHS. However, moderate fees may be charged for certain services at UHS.

All students are required, as a condition of registration, to have major medical health insurance to cover hospitalization and other care outside UHS. As a result, students are automatically enrolled in the Student Health Insurance Plan (SHIP), administered by UHS, and assessed fees for SHIP by the Campus Accounts Receivables System (CARS). SHIP coverage is year-round and worldwide and includes coverage for medical, dental, vision, and mental health services. SHIP also covers most UHS fees. SHIP coverage periods are August 15-January 14 for the fall semester, and January 15-August 14 for the spring semester. If entering students begin programs in the summer or are hired as Graduate Student Researchers in July, they will not be covered by health insurance through SHIP until August 15 when they become registered for the fall semester. For questions regarding current premiums, check the UHS website (<http://uhs.berkeley.edu/students/insurance/SHIPEnrollment.shtml>) or call 642-5700. Students may waive enrollment in SHIP if they have comparable major medical insurance. Waiver forms are available online (<http://uhs.berkeley.edu/students/insurance/waiver/welcome.shtml>). Deadlines for submission of waiver forms must be met in order to receive credit for the health insurance fee. Continuing students covered by SHIP during the spring term may use UHS services during the summer. Students not registered during the spring term but registered in summer sessions are not eligible for SHIP coverage, but may use UHS services. Students who are without SHIP and not enrolled in a summer session course will be charged fees for all UHS services. The Student Health Insurance Office (642-5700) is available to answer any questions about SHIP.

8. FINANCIAL SUPPORT

8.1 Availability of Financial Support

A few EHS students receive fellowships and traineeships through specific programs related to their academic or professional qualifications and special circumstances. However, most financial support for EHS students is obtained through students' employment as either graduate student instructors (GSIs) or graduate student researchers (GSRs). Since GSI and GSR appointments rely upon funding from the Graduate Division and from faculty extramural sources, their availability varies from year to year and cannot be guaranteed for all students. Students can obtain information about financial support from the SPH Student Services Office and the EHS Program Coordinator and by consulting the Graduate Fellowship Office (<http://www.grad.berkeley.edu/>), which maintains a listing of fellowship and student grant opportunities, the student employment web page at: <http://jobs.berkeley.edu/>.

8.2 Taxable Income

In addition to the campus Financial Aid Office, both the SPH Student Services Office and the EHS Program Coordinator are knowledgeable about the sources of funding available to School of Public Health students.

Students may also check the Graduate Fellowship Office website for financial resources, http://www.grad.berkeley.edu/financial/fellowships_resources.shtml.

Several EHS students receive funding through specific programs related to their academic interests (e.g., the National Institute of Occupational Safety and Health). Additionally, EHS receives funding from the Graduate Division and faculty extramural sources, which are divided among new and continuing students as determined by the EHS faculty. Because the sources vary each year, funding cannot be guaranteed for all students. For more information regarding financial support, you may contact the EHS Program Coordinator.

Please note that stipends available to graduate students, not loans, are taxable under the terms of the Tax Reform Act of 1986. Fellowships and grant funds used to pay tuition, fees, and other course-related expenses are excluded from taxation, but funds used for living expenses are taxable. It is up to students to claim the taxable portion of awards, because the University does not distribute W-2 forms for student awards. Additionally, the University does not withhold taxes from stipends nor does it report such stipends to the Internal Revenue Service for US citizens and permanent residents.

The University does, however, report awards made to international students. Federal income tax is withheld from student fellowship, scholarship, and grant payments at the rate of 14% unless the student is exempt under a tax treaty. California State income tax will not be withheld from student payments; however, the student is responsible for filing a California State income tax return. Any further questions regarding fellowship payments or GLACIER can be directed to the Foreign Tax Analyst by emailing glacieradmin@berkeley.edu.

All foreign individuals receiving funds from the University must have a GLACIER record. GLACIER determines residency status and tax treaty eligibility for the foreign individual. Please refer to this website for instructions: <http://internationaloffice.berkeley.edu/tax-prep>

All F-1 students receiving cash-in-hand awards from the University, separate from GSI or GSR stipends, must have a Social Security Number or Individual Taxpayer Identification Number (ITIN) in order to complete the GLACIER process and for Payroll to release their award payments. Berkeley International Office can assist F-1 students in applying for the ITIN once they have completed a GLACIER record. The latest ITIN information is available at: http://internationaloffice.berkeley.edu/itin_faqs

8.3 Nonresidents of California

The tuition and fees paid by international students and other nonresidents of California are substantially greater than those paid by California residents. There are two mechanisms by which fees for international students and other nonresidents of California can be reduced.

1) Fee Remission: A student appointed as a Graduate Student Instructor (GSI) or Graduate Student Researcher (GSR) may have some or all of his/her educational and health insurance fees paid as a benefit of employment. Although the specifics of a graduate student appointment vary, the following fee remissions generally apply for students appointed a full semester:

GSI: partial fee remission (\$8,220.00) including Student Health Insurance (SHIP) remission
GSR (25-44% appointment): partial fee remission (\$8,220.00) including SHIP
GSR (45% or greater appointment): full fee remission (\$8,827.25)

2) Filing Fee status: Filing fee status permits eligible graduate students to pay one-half of the University Registration Fee (approximately \$268.50) in lieu of full registration fees when filing a thesis or dissertation or completing a comprehensive exam. Filing fee status is approved only for students who have met the University's

continuous registration requirement and whose research requires no use of University facilities or faculty consultation time. Filing Fee status is not equivalent to registration; if students want to use University services that are supported by registration fees, they must pay additional fees.

3) Ph.D. Candidacy: Upon advancement to Ph.D. candidacy (after passing the Qualifying Examination, as described in section 6.2.3), a non-resident Ph.D. student pays tuition and fees at the rate of a California resident for up to three years, at which time the rate reverts to that for non-California residents. Note that this three-year period begins during the semester subsequent to the students' advancement, whether registered or not.

9. COMMUNICATIONS

9.1 Mailboxes

All EHS students have a mailbox located in Suite 760, University Hall. Mailboxes should be checked regularly (at least once a week) for messages and announcements. All SPH students also have a mailbox in the University Hall Student Lounge B (room 56). Although the EHS program distributes mail only to the mailboxes in the University Hall Suite 760, students should check their SPH University mailboxes for all-school announcements.

9.2 Bulletin Boards

The EHS program has bulletin boards for announcements relevant to EHS students: including seminar notices, course changes and additions, job announcements and examinations, and campus services. These bulletin boards are located outside of EHS office, Suite 760 University Hall.

9.3 Computers

While most EHS students own their own personal computers, computers are available in the microcomputer facility for the use of students in the SPH, as described in the SPH orientation materials. Refer to the School of Public Health Instructional Computing web page for locations, <http://socrates.berkeley.edu/~sphinstr/>.

9.4 E-mail

All students are required to obtain e-mail accounts at the start of their first semester at UC Berkeley (see <https://calmail.berkeley.edu/> for setting up the e-mail account). University e-mail can be accessed through the MSN program on the computers in the microcomputer facilities, any computer on the campus network, or from students' home computers via the HomeIP software. EHS faculty, staff, and students rely heavily on e-mail for on-going communication.

The following e-mail lists can be accessed:

All EHS Students:	allstudents@lists.berkeley.edu
EHS MPH Students:	ehs_mph_students@lists.berkeley.edu
EHS MS Students:	ehs_ms_students@lists.berkeley.edu
EHS Doctoral Students:	ehs_doc_students@lists.berkeley.edu
All SPH Students:	sphinfo@berkeley.edu
Multicultural Student Organization:	mcso@berkeley.edu
SPH Student Government:	http://sph.berkeley.edu/students/government.php
All SPH faculty:	sph_faculty_open@berkeley.edu
GSI Teaching & Resource Center:	gsi.berkeley.edu

9.5 bCourses

bCourses is the name of the campus' learning management systems where many course materials and communications will take place and be archived for later retrieval. Students are automatically added to the bCourses site for any course they are enrolled in. Students are advised to explore bCourses and resources available about it. See <https://bcourses.berkeley.edu/>

It is **highly recommended** that students enroll in the SPH Student site called *SPH Grads*. That site is where SPH administration and Student Services staff posts course enrollment information, deadline information, fellowship and employment (GSR/GSI positions) opportunities, announcements, etc.

Note: there are methods for filtering mail from your various bCourses sites; beware of turning off email notification for one site housed on bCourses site as notifications for all other sites will be affected. All email communications are archived in each site so if you do miss a message you can catch up there.

The eGrad website is produced by Graduate Communications & Events, distributed by email, and archived on the Web (<http://grad.berkeley.edu/category/news/>). Graduate students, alumni, faculty, and staff are invited to send news and other announcements to Richard Corten, editor, at gradpub@calmail.berkeley.edu.

9.6 Student Participation in Committees

Students are encouraged to participate in Standing Committees governing student matters. Students who have an interest in these matters should contact Darlene Francis, Associate Dean of Education, Diversity, and Inclusion at darlenefrancis@berkeley.edu regarding School Committees on the Berkeley Campus, or Dr. Ellen Eisen, Chair of the EHS Division, at eeisen@berkeley.edu.

10. MISCELLANEOUS

10.1 Establishing California Residency

Because of the high cost of out-of-state tuition, students are highly encouraged to establish legal residency in California. Some of the steps for establishing California residency should be fulfilled immediately upon arrival in Berkeley (August or early September) because it takes one year to establish intent to reside in California. This is especially important for students receiving financial support from extramural grants because these sources often do not have adequate funds to pay for non-resident tuition. Since it is the obligation of the student to establish California residency as expeditiously as possible, the EHS Group assumes no responsibility to provide financial support for out-of-state tuition and fees beyond two years of a student's program. Students should contact the Residency Office at 642-7209 for specific information on establishing residency.

10.2 Human Subjects Protection

The University of California is committed to the ethical principles for the protection of human subjects to research set forth in the Belmont Report of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. The University recognizes and accepts responsibility, which it shares with its investigators and other researchers, for determining that research involving human subjects is properly conducted.

If your research activities involve human or animal subjects, you must follow the guidelines and obtain an approved protocol **before you begin your research**. Visit web page, <http://grad.berkeley.edu/academic-progress/pre-candidacy/research-human-animals/>, or contact the Committee for the Protection of Human Subjects (<http://cphs.berkeley.edu/> or 642-7461) or the Animal Care and Use Committee (<http://www.acuc.berkeley.edu/> or

642-8855)

Disabled Students Program

The Disabled Students' Program offers a wide range of services for students with disabilities. These services are individually designed, and based on the specific needs of each student as identified by Disability Specialists. The Disabled Students' Program website at <http://dsp.berkeley.edu> and can be contacted at 642-0518.

The standard campus process by which students must verify a disability if they wish to request an accommodation is to register with the Disabled Students Program, which has authority to issue the required Letter of Accommodation. A student should contact DSP to determine if there are any accommodations to which he or she is entitled, including but not limited to, accommodations for visual and hearing disabilities, Attention-Deficit/Hyperactivity Disorders, learning disabilities, and psychological disabilities, including depression. Students need to follow DSP's disability verification requirements in applying for accommodations

10.3 Supplies and Expenses

There are no funds available to cover purchase of supplies and other expense items, such as photocopying, faxing, and mailing costs. These supplies and expenses must be charged to specific university accounts or courses.

Appendix A. EHS Preliminary Graduate Group Examination

A.1 Introduction

The EHS Preliminary Graduate Group Examination is the first of a two-part exam qualification process for students in the EHS Ph.D. program. Successful completion of the EHS Preliminary Graduate Group Examination is a prerequisite for the Ph.D. Qualifying Examination.

It is expected that students will take the EHS Preliminary Graduate Group Examination after 3 or 4 semesters of course work. A student who wishes to take the examination must consult with his or her faculty adviser before scheduling. .

In consultation with his or her faculty adviser, the Ph.D. student should select three EHS faculty members to be on their EHS Preliminary Graduate Group Examination Committee, including two members of the EHS Graduate Group (see section 2.3 for EHS Group membership). It is advisable that the same two EHS Graduate Group Members also be on the Qualifying Examination Committee. In addition, the composition of the Graduate Group Examination Committee must reflect faculty who specialize in Exposure Assessment or Risk Assessment as well as faculty who specialize in Toxicology, Epidemiology, or other fields dealing with biological response to environmental agents. The faculty adviser cannot serve on the EHS Preliminary Graduate Group Examination Committee. Lastly, the Ph.D. student can recommend which EHS faculty member will serve as the Chair of their EHS Preliminary Graduate Group Examination Committee and this recommendation is given due consideration by the EHS Preliminary Graduate Group Examination Committee.

The EHS Preliminary Graduate Group Examination is itself a two-part examination, consisting of written and oral components. Although participating in the oral component of the EHS Preliminary Graduate Group Examination is conditional upon successful completion of the written component, both written and oral dates should be scheduled in advance. A copy of the written component must be submitted to each committee member at least two weeks before the oral component is to take place. In addition, one copy of the written component should be filed with the EHS Program Coordinator.

A.2 Purpose of the EHS Preliminary Graduate Group Examination

The EHS Preliminary Graduate Group Examination is intended to assess the student's understanding of the concepts, methods, and content of EHS and to evaluate a student's readiness to engage in doctoral research. The written examination is also intended to help the student develop ideas for research and to prepare grant proposals. Additionally, the EHS Preliminary Graduate Group Examination is intended to provide feedback to the student with regard to areas of particular strength as well as those areas for which review and/or preparation would be desirable before the student takes the Qualifying Examination.

It is important for the student to understand that EHS Preliminary Graduate Group Examination is not merely a test of EHS concepts and methods gleaned from course work but evaluates the integrative and communication skills that will be expected for subsequent doctoral work.

A.3 Written Component of the EHS Preliminary Graduate Group Examination

Conceptual. This refers to the student's ability to review a body of data relevant to the problem and to provide a coherent basis for formulating the research design. The committee will pay particular attention to review of the literature and its pertinence to the research question and justification of the particular approach selected for investigating the question. The written component of the Graduate Group Examination involves writing a research proposal on a topic selected by the student and his or her faculty adviser, which relates to the intended dissertation topic. In preparing their written exam (the grant proposal), students may use any written materials that are available and to consult with their faculty advisers, other faculty members, and other students. However, students may not solicit assistance in the primary writing of the proposal.

In preparing the written component of the examination, the student is expected to demonstrate the following skills:

Problem Solving. This refers to the student's ability to select appropriate methods for obtaining and analyzing data with which to evaluate the research question.

Critical/Creative. This involves a discussion of hypothetical outcomes of the proposed study as well as their interpretation and significance. Interpretation includes limitations of the proposed study design and anticipated future research.

Writing Skills. The ability to communicate clearly and efficiently will be evaluated. The use of proper, grammatically correct English is expected.

A.3.1 Format of the written component of the Preliminary EHS Graduate Group Examination

The proposal should be formatted as single spaced, with 1-inch margins, using the Times New Roman font, and a font size of 12 characters per inch. The organization of each individual section of the paper is left to the student's discretion.

The following format of the written EHS Preliminary Graduate Group Examination is similar to a NIH-style grant application:

- a) Table of Contents (1 page)
- b) Abstract (1/2 page). Provide a succinct overview of the proposed research, including the rationale for study,

- and generally comment on design and the expected results and implications.
- c) Specific Aims and Rationale (1 page). Provide a clear statement of the research questions and hypotheses and break the project into a set of concise specific aims.
 - d) Background (literature review) (3 pages). Provide a literature review that synthesizes and critiques the current knowledge on the topic. Provide a logical framework for the proposed research.
 - e) Research Plan (6 pages). Identify and justify the methods that will be used, data that will be collected, and the analyses that will be performed.
 - f) Discussion, Significance, and Future Steps (2 pages). Discuss the strengths and limitations of the study design and the implications of the expected outcomes for future research.
 - g) Human Subjects Concerns (up to 1 page).
 - h) References (no more than 4 pages).
 - i) Appendix (no more than 10 pages). This is optional and should include only essential tabular or graphic material.

The absolute page limit is 12 pages for sections (c) – (f). Proposals that exceed the above page limits will not be accepted and will be treated as a withdrawal from the examination.

It is expected that the written proposal will be revised following the EHS Preliminary Graduate Group Examination and then submitted to the Qualifying Examination Committee as a prelude to the oral Qualifying Examination.

A.4 Oral Component of the EHS Preliminary Graduate Group Examination

The oral component of the EHS Preliminary Graduate Group Examination begins with a 20-minute presentation on the proposed research by the student. At the discretion of the committee chair, the student may aid the presentation with visual aids, such as PowerPoint slides. (Students should clear this with the committee chair prior to the examination). The oral will focus on the student's knowledge of the EHS core subjects, clarification of the ideas and concepts in the written proposal, and integration of established knowledge with the proposed research. The oral component of the EHS Preliminary Graduate Group Examination usually requires 2-3 hours.

A.5 Pass/Failure of the EHS Preliminary Graduate Group Examination

All students will be graded on a pass/not pass basis for the EHS Preliminary Graduate Group Examination. A pass will only be granted upon successful completion of both written and oral components of the EHS Preliminary Graduate Group Examination. In the event that a student does not pass the EHS Preliminary Graduate Group examination, he or she will be permitted to take the examination a second time, provided that this occurs within six months of the date that the first exam was not passed. Failure of a second examination will result in termination of the student's Ph.D. program.

Appendix B. Ph.D. Qualifying Examination

Appendix B. Ph.D. Qualifying Examination

B.1 Purpose of the Qualifying Examination.

The purpose of the Qualifying Examination is to formally certify that the Ph.D. student is prepared in both the major and minor areas of study to move on to dissertation research. Here it is understood that the major is EHS and that the student has selected two minor areas of study which are relevant to EHS or one of its specialty areas. Generally the minor areas are those important to the student's research project and should be selected based upon discussion with the faculty adviser. For example, biostatistics is a common minor since most doctoral students conduct statistical analyses of data collected in the conduct of their dissertation research. The minor areas of

study are part of the information required in completion of the Application for Qualifying Examination (http://grad.berkeley.edu/policies/pdf/qe_application.pdf).

To be eligible to take the Ph.D. Qualifying Examination, the student must:

- a) be registered for the semester in which the exam is taken or, if taken during winter or summer break, be registered in either the preceding or the following semester,
- b) have completed at least one semester of academic residence,
- c) have at least a B average in all work undertaken in graduate standing, and
- d) have no more than two courses graded Incomplete.

B.2 Qualifying Examination Committee

The composition of the four-member Qualifying Examination Committee is proposed by the student and his or her faculty adviser and must be approved by the EHS Faculty Adviser and the Graduate Division. The student must apply to take the Qualifying Examination, using the form http://grad.berkeley.edu/policies/pdf/qe_application.pdf, which must be approved by the Graduate division at least three weeks before the scheduled date of the exam. (See section 6.2.2 for details regarding selection of members for the Qualifying Examination Committee). It is important that the student contact each member of the Qualifying Examination Committee, gain his/her agreement to participate, and discuss the committee member's expectations regarding the breadth and depth of material that might be covered in the exam.

B.3 Format and Conduct of the Qualifying Examination

The format of the examination is generally similar to that of the EHS Preliminary Graduate Group Examination (see Appendix A). The chair of the Qualifying Examination Committee is responsible for conducting the examination. A brief meeting of the committee is usually held before the examination begins to discuss the examination process and the student's background. The examination is usually three hours in length. The student is expected to prepare a research proposal, which, after review and discussion with the faculty adviser, is circulated to the committee at least two weeks before the examination. This proposal is usually a revised version of the written portion of the EHS Preliminary Graduate Group Examination. The Qualifying Examination begins with a 20-minute presentation on the proposed research by the student. At the discretion of the committee chair, the students may aid the presentation with visual aids, such as PowerPoint slides. (Students should clear this with the chair prior to the examination). Then the committee asks questions which will cover the proposed research as well as subject matter in the major (EHS) and minor areas.

The criteria for evaluation of performance in the Qualifying Examination are that the student has an adequate mastery of the major and minor areas, has shown an ability to define a research problem of significance, and has a knowledge of the scientific and technical background necessary to pursue this problem independently and with a reasonable probability of advancing knowledge in the area. It is not the responsibility of the Qualifying Examination committee to approve the research prospectus as a dissertation project, although committee members often comment on its feasibility and the strengths and weaknesses of the approach. (It is the Dissertation Committee that guides the project itself and ultimately is responsible for its approval).

B.4 Outcome of the Qualifying Examination

At the conclusion of the Qualifying Examination the student is verbally informed of the result. There are two outcomes, pass and fail. Two types of failure are possible. One type of failure recommends a second examination after further preparation, while the second type of failure is final, pending any formal appeals process. The chair of the examining committee is responsible for submitting a report of the outcome, which must be signed by each member of the committee, and must also be signed by Chair of the EHS Graduate Group. This report is submitted to the Graduate Division and, subsequently, communicated officially.

Upon notification of the outcome of the examination, successful candidates should file with Graduate Division an Application for Candidacy for the Degree of Doctor of Philosophy (<http://www.grad.berkeley.edu/policies/forms.shtml>).

Appendix C. The Ph.D. Dissertation

C.1 Dissertation Process

Once a student passes the Qualifying Exam and has advanced to candidacy, he or she is ready to formally start the dissertation process. EHS Ph.D. students fall under the guidelines of Plan B of the Berkeley Graduate Division, that stipulates a committee of three Berkeley Academic Senate members guide the research and judge the merits of the dissertation. Since the faculty adviser is either the chair or co-chair of the Dissertation Committee, it is essential that the Ph.D. student be in close touch with the faculty adviser throughout the process of formulating the dissertation project and carrying it through to completion. The central role of the chair is underscored by the Graduate Division guideline that “Under no circumstances should a student be permitted to complete a dissertation that the Dissertation Chair finds mediocre and that consequently prevents the chair from writing a strong letter of support.”

C.2 Dissertation Committee

As indicated in section 6.3.1, the Dissertation Committee consists of either three or four members, of which two must be members of the EHS Graduate Group and one must not be a member of the EHS Graduate Group (but must be a member of the Academic Senate). The faculty adviser will be either the Chair (if a member of the EHS Graduate Group) or Co-chair (if a member of the EHS Division) of the Dissertation Committee.

The Ph.D. student should keep the Dissertation Committee apprised of progress, at least annually as required by the Graduate Division (see section 6.2.3), and should seek advice from committee members on technical issues that lie within their expertise. During the process of writing the dissertation, it is expected that the Ph.D. student will work closely with the faculty adviser, preferably using manuscripts for peer-reviewed journals as milestones for the dissertation research (see section 6.3.2). If properly formulated, such manuscripts can serve as logical chapters in the dissertation. Some Dissertation Committee members may wish to review individual chapters, while others may prefer a complete draft. The Dissertation Committee should be given ample time for review and time for revisions, which may be substantial. In addition, but before final action is taken upon the dissertation, the Dissertation Committee may require the Ph.D. student to defend the dissertation in a formal oral examination.

C.3 Research Involving Human or Animal Subjects

In planning a proposal with their Dissertation Chairs, Ph.D. students should be aware that if their research involves human subjects, they must have their proposed research protocol reviewed and approved by the Committee for Protection of Human Subjects (CPHS) before they begin their research. If they are planning research involving live vertebrate animals, the students must have their protocols reviewed and approved by the Animal Care and Use Committee (ACUC). Both of these committees maintain websites with complete details (listed in section 6.2.3).

C.4 What Students Should Know Before Filing a Dissertation

In order for the Graduate Division to accept a dissertation, all requirements must be met (e.g., formatting and pagination, number of copies, length of abstract, margins, acceptable archival paper, size of printer font, etc.). Because of the scope of the requirements for preparing and submitting the manuscript, students should thoroughly

acquaint themselves with the instructions that are found in Guidelines for Submitting a Doctoral Dissertation (<http://grad.berkeley.edu/academic-progress/dissertation/>).

The Guidelines provide other useful information, including copyrighting and the option of filing the dissertation electronically for transmission to ProQuest Dissertation Publishing (formerly UMI). Also, if some portions of the dissertation have been published prior to filing, formal permissions are required of all coauthors for the material to be included in the dissertation. Again, see the Guidelines for details.

C.5 Dissertation Colloquium

At the end of the academic year, all PhDs awarded that year will be asked to present a brief overview of their thesis at the EHS dissertation colloquium.