

MARYLAND HIGHER EDUCATION COMMISSION
ACADEMIC PROGRAM PROPOSAL

PROPOSAL FOR:

- NEW INSTRUCTIONAL PROGRAM**
 SUBSTANTIAL EXPANSION/MAJOR MODIFICATION
 COOPERATIVE DEGREE PROGRAM
 WITHIN EXISTING RESOURCES or **REQUIRING NEW RESOURCES**

(For each proposed program, attach a separate cover page. For example, two cover pages would accompany a proposal for a degree program and a certificate program.)

Johns Hopkins University

Institution Submitting Proposal

Fall 2016

Projected Implementation Date

Master of Arts

Award to be Offered

1214.39

Suggested HEGIS Code

Public Health Biology

Title of Proposed Program

51.2201

Suggested CIP Code

Bloomberg School of Public Health

Department of Proposed Program

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Signature and Date

03/03/2016

President/Chief Executive Approval

N/A

Date

Date Endorsed/Approved by Governing Board

**The Johns Hopkins University
Bloomberg School of Public Health
Proposal for a New Academic Program**

Master of Arts in Public Health Biology

A. Centrality to institutional mission statement and planning priorities

1. Program description and alignment with mission

The Johns Hopkins University Bloomberg School of Public Health (JHSPH) proposes to launch a new Master of Arts in Public Health Biology, a novel, public health-oriented online degree program for part-time students designed to foster knowledge of and appreciation for the many ways that modern biological principles and research methods can be applied to the identification, treatment, and prevention of conditions of relevance to the health of the public.

The proposed program is interdepartmental, involving the active participation of the School's three biological sciences-based departments: Biochemistry and Molecular Biology (BMB), Environmental Health Sciences (EHS), and Molecular Microbiology and Immunology (MMI). There is required coursework offered by these departments and also in Biostatistics and Epidemiology. The program culminates in the writing of a literature-based scholarly thesis. The program is designed to provide a solid, conceptual basis for an understanding of the rationale, tools and approaches that are essential for addressing problems in public health.

The proposed program will require the successful completion of 48 term (quarter) credits, including a 5-credit literature-based thesis. Students will be expected to complete the degree within twelve 8-week terms, or 3 years.

2. Alignment with institutional strategic goals

Johns Hopkins University strategic goals

The proposed program advances Johns Hopkins University's Ten by Twenty vision and strategic goals in a number of significant ways. The program will support the core academic mission of the University by strengthening interdisciplinary collaboration in teaching and training. Additionally, the program will enhance the impact of the Bloomberg School of Public Health, and thus the University, by providing access to students across the globe.

Johns Hopkins Bloomberg School of Public Health strategic goals

The mission of The Johns Hopkins University is to educate its students and cultivate their capacity for life-long learning, to foster independent and original research, and to bring the benefits of discovery to the world. The mission of the Johns Hopkins Bloomberg School of Public Health is to improve health "through discovery, dissemination, and translation of knowledge and the education of a diverse global community of research scientists and public health professionals." The MA in Public Health Biology degree will

help fulfill this mission through collaborative online teaching that builds on the combined strengths of the Departments of Biochemistry and Molecular Biology (BMB), Environmental Health Sciences (EHS) and Molecular Microbiology and Immunology (MMI). The overarching philosophy of the program is that understanding the biological basis of the causes of disease will help prevent and treat these diseases in populations throughout the world. Thus, the program is designed to provide students with knowledge of the application of biological principles to public health, the conceptualization of research questions, the ability to interpret results, and how to apply and interpret such results in the context of human health. The program will provide the students with exposure to faculty who are preeminent in their fields, and offer unmatched opportunities for advanced training that addresses local and global public health issues.

B. Adequacy of curriculum design and delivery to related learning outcomes

1. Program outline and requirements

A full course listing with course titles and descriptions is provided in Appendix A.

The proposed MA in Public Health Biology program requires students to successfully complete 48 credits. The program consists of courses in biochemistry, molecular biology, environmental health sciences, immunology, epidemiology and biostatistics, and a required scholarly, 20-30 page literature-based thesis that demonstrates critical synthesis and integration of existing primary literature.

As they begin the culminating thesis, students, with the advice and approval of the Program Director and the Advisory Committee, will identify a faculty member in BMB, EHS or MMI with whom to prepare the master's thesis. Together with the faculty member, students will identify at least one additional faculty member who also will review the thesis and provide critical input. Students will be expected to develop the thesis through frequent interaction with the faculty members, using online conferencing technologies available at JHSPH. At the completion of the thesis, students will present their results to fellow students and faculty in a synchronous online presentation.

Admission standards will be as rigorous as those established for other master's degree programs in the Bloomberg School of Public Health. Applicants' academic transcripts, standardized test scores (including TOEFL where applicable), letters of recommendation, and statements of purpose will all be carefully considered in the admissions process. Persons eligible for admission to the MA in Public Health Biology program must: (i) possess a baccalaureate-level degree from an accredited college or university, (ii) submit evidence of quantitative skills and ability, (iii) submit three letters of recommendation, (iv) submit a statement of purpose that demonstrates compatibility of the applicant's career goals with the educational objectives of the program, and (iv) demonstrate proficiency in English.

2. Educational objectives and student learning outcomes

The educational objective of the MA in Public Health Biology program is to prepare students from diverse backgrounds to apply biological principles to public health issues, conceptualize research questions, interpret results and apply these skills in the context of human health.

Upon successful completion of the MA in Public Health Biology, students will be able to:

- Describe the molecular, cellular, immunological, and physiological bases of selected human diseases and conditions;
- Describe biological principles that underlie the development of disease and its prevention, control and management;
- Critically evaluate data described in scientific papers and integrate data from multiple papers into coherent theories about the regulation of complex biological processes and diseases;
- Apply statistical principles to the analysis of biological data and apply findings to the understanding and treatment of human disease;
- Compose, explain and defend a 20-30 page scholarly thesis that demonstrates a deep understanding of how biological principles and methods are used to understand, treat and/or prevent a particular condition of importance in the public health arena; and
- Communicate effectively with the general public, professionals and other stakeholders on issues related to immunology, biochemistry, molecular biology, environmental health sciences and public health.

3. General education requirements

Not applicable.

4. Specialized accreditation/certification requirements

Not applicable.

5. Contractual agreements with other institutions

Not applicable.

C. Critical and compelling regional or statewide need as identified in the State Plan

1. Demand and need for program

Many current positions in public health biology do not require a PhD, but do require a background in how biology, statistics and epidemiology can be applied to the identification, understanding, prevention and treatment of public health problems throughout the world. The MA in Public Health Biology program will serve college graduates who wish to gain the increased didactic coursework required for entry into advanced degree programs in research, medicine or dentistry, and to gain credentials for advancement in industry, academia or government. Graduates of the program will be equipped to participate in the responsible development of new knowledge and new ways of saving lives and improving health in Maryland and beyond.

2. Alignment with 2013–2017 Maryland State Plan for Postsecondary Education

The 2013-2017 Maryland State Plan for Postsecondary Education articulates six goals for postsecondary education: 1) quality and effectiveness; 2) access, affordability and completion; 3) diversity; 4) innovation; 5) economic growth and vitality; and 6) data use and distribution.

The MA in Public Health Biology program supports Goal 5 of the Maryland State Plan for Postsecondary Education, which states that Maryland will stimulate economic growth, innovation, and vitality by supporting a knowledge-based economy, especially through increasing education and training and promoting the advancement of research. Maryland's economy includes a number of high-skill industries, including biotechnology, telecommunications, aerospace, and defense. An educated workforce that can adapt to changes in the global market is a vital resource in creating and attracting new businesses and in supporting a healthy, knowledge-based economy. In addition, extensive knowledge of the biological basis of public health issues will continue to ensure that innovations are brought to market to generate greater economic growth. To remain nationally and globally competitive, Maryland's postsecondary institutions must continue to innovate and collaborate with private industry, nonprofits, and each other so that 1) graduates' education and training align with business and workforce prerequisites and emerging needs; and 2) intellectual properties developed through innovation and invention at the State's university research facilities are commercialized. Goal 5 of *Maryland Ready* outlines key considerations for developing partnerships addressing the State's education and training needs as well as promoting the commercialization of research.

In addition, the changing demographics of Maryland's population and workforce require new skills, new opportunities to obtain credentials, and new patterns of enrollment in postsecondary education. Workers, including many who have already earned postsecondary degrees, must have the ability to reenter postsecondary education to secure training and credentials that will allow them to maintain or upgrade their skills (*Maryland Ready, 2014*). The MA in Public Health Biology program will advance the State's goal to be a "national and international leader in higher education." Additionally, courses in this

program use the desired “new modes of delivery and programmatic initiatives designed to accelerate student success and also better serve the needs of the State’s increasingly diverse student population, which consists of more returning adults as well as a larger number of students from varied backgrounds.”

D. Quantifiable and reliable evidence and documentation of market supply and demand in the region and State

1. Market demand

The opportunities for individuals with the degree are vast and available nationwide, with employment opportunities in a number of fields rather than in one specific industry or occupation. Many current positions in teaching, research labs and research administration require a strong background in the biological sciences, a sound, working knowledge of statistics, and an understanding of public health issues. Many such positions are filled by individuals with a master’s degree, not a PhD. The proposed program will provide detailed knowledge of the biological sciences and of the application of this knowledge to the identification, understanding, prevention and treatment of conditions of relevance to the health of the public. The program will provide its part-time students with a pathway to career opportunities or to advancement in pre-college and college teaching, basic and clinical research, industry and governmental research organizations, or might lead to advanced graduate work.

Maryland is home to more than 500 core bioscience companies, representing approximately 8% of the U.S. industry. This is the second largest cluster (per capita) in the U.S. (Ernst and Young, 2006-2008). Approximately 50% of Maryland’s bioscience industry is engaged in therapeutic development, primarily biotherapeutics. Another 25 % provides supporting research services (“CROs”). The rest are creating gene-based diagnostics, integrating biologics and nanotechnology into medical devices, and developing innovative R&D technology.¹ Overall bioscience industry employment in Maryland is growing robustly. For example, the rise was 14.5% from 2001 to 2006, which added 3,200 jobs to reach more than 25,000 jobs.

Although Maryland enjoys a high concentration of bioscience research workers, industry leaders have pointed to an insufficient supply of individuals with backgrounds in the biosciences, including bioscience scientific and management talent.

¹ <http://marylandbiocenter.org/bioscience%20of%20maryland/pages/factsandfigures.aspx>.

Projections of occupational needs for persons to serve as members of research teams and in management in Maryland for the years 2012-2022 are as follows:

Life Science Occupations - Maryland Occupational Projections - 2012-2022					
Occupational Title	Employment			Openings	
	2012	2022	Change	Replacement	Total
Life science occupations, including lab management	53,548	57,128	3,580	14,812	18,400
Life and physical science technicians	14,154	15,332	1,178	4,931	6,109
Agricultural and food science	622	663	41	225	266
Biological technicians	5,279	5,736	457	1,582	2,039
Chemical technicians	747	790	43	184	227
Geology and petroleum industry	205	220	15	74	89
Environmental science and environmental health	839	912	73	330	403
Forensic science	678	717	39	267	306

2. Educational and training needs in the region

The Bloomberg School of Public Health receives about 250 applications per year from individuals seeking onsite master's level training in the Departments of Biochemistry and Molecular Biology, Environmental Health Sciences, and Molecular Microbiology and Immunology. The onsite programs are comparable to the proposed online MA in Public Health Biology program, but are designed largely for full-time students seeking to improve credentials to enter professional schools.

The MA in Public Health Biology program is designed to attract part-time individuals who already are employed, and who seek a challenging, graduate-level degree with which to enhance or gain credentials required for positions in teaching, academic institutions, industry, or governmental research organizations. As is the case of the current, traditional onsite master's program, some among these students will pursue the online MA in Public Health Biology program part-time to enhance their credentials for medical or graduate school, but wish to be employed while doing so.

3. Prospective graduates

The MA in Public Health Biology anticipates enrolling 10 students its first year. The average part-time student admitted for the Fall 2016 term will complete the program in about 3 years, by 2019. Twenty to thirty students are expected to graduate in 2019 and 2020 and 20-30 annually in subsequent years.

E. Reasonableness of program duplication

1. Similar programs

Although there are online master's programs in the State of Maryland that attract adult learners, they are not designed to extend from basic biological concepts to environmental health and more broadly to the biological basis of public health. The uniqueness of the Bloomberg School of Public Health provides a unique environment in which such an approach is possible. The following five programs have been identified that, in some ways resemble the MA in Public Health Biology.

Institution	Program
Johns Hopkins' Advanced Academic Programs Division	MS Biotechnology
University of Maryland University College	MS Biotechnology
University of Maryland Baltimore County	Master in Professional Studies Biotechnology
University of Maryland School of Medicine	MS Biomedical Research
University of Maryland	Cellular and Molecular Biomedical Science Master's Program

A Master of Science in Biotechnology degree is offered online by Johns Hopkins University, Advanced Academic Programs division. This program includes basic, applied and lab science, with an industry focus. As with the proposed MA in Public Health Biology program, the AAP program provides students with online coursework in the biological sciences. The program is designed for working professionals in biological research and in the global biotechnology industry. This program has similarities to the proposed MA in Public Health Biology program in that it attracts adult learners and provides coursework in biochemistry and molecular biology.

The bench-to-bedside-to-population approach of the MA in Public Health Biology, however, is a very different orientation from that of the AAP program, and is likely to attract different students. Several of the MA in Public Health Biology courses deal with the biological bases of such conditions as infectious disease, vaccination, nutrition, lung disease, pandemic influenza, contraception, hormone replacement, disease susceptibility, environment, skin, and stem cell therapeutic utilization. Such an orientation is possible because the courses of the MA in Public Health Biology program are taught by active researchers in the fields in which they teach. In addition to the basic science components of the program, students will receive in depth exposure to epidemiology and biostatistics, also taught by experts in the Department of Epidemiology and Department of Biostatistics. The literature-based master's thesis will provide a unique means by which to apply learning to public health issues, including the presentation and defense of the thesis online. In each of these ways, the program differs in its orientation from that offered by AAP.

Four additional programs in the State of Maryland have been identified as resembling the MA in Public Health Biology program:

- The University of Maryland University College offers a Master of Science in Biotechnology. The program has four specializations: Bioinformatics, Biotechnology Management, Biosecurity and Biodefense, and Biotechnology Regulatory Affairs. None of these specializations translates biological knowledge to public health issues.
- The University of Maryland Baltimore County offers the Master in Professional Studies Biotechnology. This program provides instruction in the life sciences along with coursework in regulatory affairs, leadership, and financial management in life science-oriented business. As described, the program is designed to prepare science professionals to move from the research bench to the business side of biotechnology. It has little in common with the proposed MA in Public Health Biology program.
- The Master of Science in Biomedical Research of the University of Maryland, School of Medicine has similarities with the proposed MA in Public Health Biology. The program is designed for medical technologists and for students with undergraduate life science degrees. One of its two tracks (biotechnology) is a research track that requires coursework in cell biology, molecular biology, biochemistry and regulatory issues. It is a small program, however, having graduated only 18 students in the past 3 years. Clearly, the current graduation numbers in the University of Maryland program are not nearly enough to meet state or regional needs. Moreover, it lacks the public health orientation of the proposed MA in Public Health Biology program.
- The Master's in Cellular and Molecular Biomedical Science Program at the University of Maryland emphasizes medically-relevant scientific research and education, and can be completed part-time. The program describes itself as designed to develop research skills and familiarity with the state-of-the-art biomedical tools and methodologies, and to lead to positions as lab managers and technicians. This program is similar to the MA in Public Health Biology, but is onsite, not online, does not have a public health orientation in its coursework, and does not culminate in the preparation of a scholarly thesis.

2. Program justification

The proposed MA in Public Health Biology will provide concrete training in biology and public health with particular focus on the application of theory and methods of inquiry. This program will provide the knowledge and tools necessary for graduates to become critically engaged in investigating and addressing long-standing and emerging public health issues that have local, national, and global import. The uniqueness of this program lies in coursework directed to the application of modern biochemistry, molecular biology, immunology, statistics and epidemiology to environmental health and to relevant public

health issues worldwide. For some students, the program will serve as a terminal master's program that can lead directly to positions in academic, industrial or government laboratories. For others, it will provide the basis for them to obtain promotions in positions already held, or as an entrance to advanced degrees. With an aging population and a growing need for healthcare, the range of jobs accessible to biomedical graduates is large and growing.

The program will be grounded in real-world challenges and informed by leading edge scholarship, with a diverse faculty of the leading experts in the field and a student body bringing professional experiences to the classroom.

F. Relevance to Historically Black Institutions (HBIs)

An appropriate student for the MA in Public Health Biology program would apply after attending and completing at least a baccalaureate degree at any undergraduate institution, including any of Maryland's Historically Black Institutions. The proposed program would not directly affect the implementation, maintenance, uniqueness, identity or mission of these institutions.

G. Evidence of compliance with the Principles of Good Practice

See Appendix B for the evidence that this program complies with the Principles of Good Practice noted above.

H. Adequacy of faculty resources

See Appendix C for a representative list of faculty who will teach and act as mentors in the proposed program. Those teaching the courses that may be taken by the MA in Public Health Biology students are full-time faculty of the Bloomberg School of Public Health. Program faculty are from the Bloomberg School of Public Health's Departments of Biochemistry and Molecular Biology, Environmental Health Sciences, Molecular Microbiology and Immunology, Biostatistics and Epidemiology. All are active research scientists who also actively participate in teaching and thus in educating the next generation of leaders. Some among the faculty who will participate in the MA in Public Health Biology program have earned prestigious teaching awards from the Bloomberg School of Public Health, including its highest awards, The Golden Apple, and mentorship awards from the School of Public Health and the Krieger School of Arts and Sciences.

I. Adequacy of library resources

The book collections at the Johns Hopkins University number almost 2.5 million volumes, selected to support the academic and research interests of all departments and divisions of the University. The system includes The William H. Welch Medical Library in the School of Medicine, the Abraham M. Lilienfeld Library in the School of Public Health, and the Milton S. Eisenhower Library on the Homewood campus. Most periodicals are available to University faculty, staff and students online from any location in the world. All facilities have access to online databases in addition to a distinguished collection of research resources. The interlibrary loan department makes the research collection of the nation available to faculty and students. The libraries offer a variety of instructional services, including orientation

tours, and electronic classrooms designed to explain the library resources available for research and scholarship. MA in Public Health Biology degree students will have access to all libraries and library informationists.

J. Adequacy of physical facilities, infrastructure and instructional equipment

As described further in Appendix B, online program offerings will be developed, delivered and supported via JHSPH's Center for Teaching & Learning (CTL) using a proprietary course management system – CoursePlus.

K. Adequacy of financial resources with documentation

See Appendix D for detailed financial information.

L. Adequacy of provisions for evaluation of program

Program level evaluation activities will include an annual assessment of program inputs, processes and outputs to generate a report on program applicants and admitted students, course enrollment, faculty participation, pedagogical innovations and program accomplishments/recognition. Evaluation of student learning and achievement will focus on the early identification of students' goals/objectives and individualized learning outcomes; students' acquisition of knowledge and skills, and the degree to which the program is fostering students' achievement of the degree competencies as demonstrated by each student's electronic learning portfolio.

Post-degree professional and academic accomplishments of graduates will also be tracked through Exit and Alumni Surveys that are conducted for all degree programs. Student course evaluations, conducted at the end of each term, will provide feedback about both courses and faculty. The evaluations include questions addressing the course overall, the instructor, and assessments of learning. All MA in Public Health Biology faculty and courses will be evaluated annually by the Program Chair and the Advisory Committee. The information is also used to revise, add or eliminate courses to meet changing needs of the workplace and address student and faculty concerns about course materials and presentation.

M. Consistency with the State's minority student achievement goals

Any student meeting the admissions requirements can apply to the MA in Public Health Biology program. The program will work to help all accepted students improve their workplace competitiveness and reach their professional goals, an aim consistent with the State's minority student achievement goals.

N. Relationship to low productivity programs identified by the Commission

Not applicable.

Appendix A

Course List and Descriptions

550.630.81, 550.631.81 Public Health Biology I and II (3 credits each, required)

Discusses the molecular, cellular, physiological, genetic and immunological determinants of human diseases and disease susceptibility, including infectious disease, nutritional deficiencies, reproductive and developmental anomalies, and effects of exposures to toxic environmental agents. Ecological principles that determine the distribution of infectious disease in human populations are explored, as is how principles of the human immune system provide the rationale for methods of immunization. The focus is on how biological principles help to understand the development, treatment and prevention of disease, and how to assess risk from potentially hazardous agents and behaviors.

140.611.81, 140.612.81 Statistical Reasoning I and II (3 credits each, required)

Provides students with a broad overview of the biostatistical methods and concepts used in the public health sciences, emphasizing the interpretation and conceptual foundations of statistical estimation and inference. They give the student the skills to objectively evaluate public health research. Among the major topics covered in the courses are data summarization and presentation, confidence intervals and hypothesis testing, study design, multiple linear regression, multiple logistic regression, and survival analysis techniques including proportional hazards regression. Importantly, these topics are reinforced with many "real-life" examples drawn from recent biomedical literature.

340.721.81 Epidemiologic Inference in Public Health I (5 credits, required)

Introduces principles and methods of epidemiologic investigation of disease and other health states. It presents different types of study designs, including randomized trials, cohort and case-control studies, measurement of exposures and outcomes, risk estimation, surveillance, program evaluation, and causal inference. The course also links epidemiologic inferences with the development of policy. Activities provide experience in applying epidemiologic methods, interpreting findings, and drawing inferences. There is emphasis on the role of epidemiologic methods in determining the etiology of disease and other health states (e.g., aging, injury, mental health) in preventing disease and improving health, and how epidemiologic methods are used in public health practice, including in conducting outbreak investigation and surveillance, evaluating screening programs and health interventions, and developing health and environmental policy.

550.865.81 Public Health Perspectives on Research (2 credits, required)

Introduces the substantive and methodologic bases for public health research, emphasizing the critical roles of the quantitative, qualitative, biologic, social, and behavioral sciences in the improvement of public health. The course highlights principles of high-quality research, including the value of a population perspective, interdisciplinary cooperation, the importance of new measurement techniques, and the interface between theory and practice. The course is designed to provide students with information about the interactions between the public and the researcher.

120.600.81 Biochemistry – An Introductory Course (4 credits) TBD (To be converted from existing onsite course)

Explores the structures of the principal cellular macromolecules and their roles in cellular processes. The forces that underlie specific recognition processes will be emphasized, as will the mechanisms of enzyme action and biochemistry of nucleic acids. The structures of macromolecules to their functions will be emphasized, along with the methods used to study address such issues at a cellular molecular level and in relationship to disease.

120.602.81 Introduction to Molecular Biology (4 credits) TBD

Discusses the synthesis of macromolecules, the genetic code, regulation of gene expression and gene function, and recent advances in biotechnology. A focus will be on understanding molecular mechanisms underlying genome structure, gene regulation, and disease processes.

120.620.81 Fundamentals of Reproductive Biology (3 credits)

Addresses the basic physiological, biochemical and molecular mechanisms that underlie male and female reproduction and that pertain to such reproductive health issues as contraception, infertility, pregnancy, sexually transmitted diseases, reproductive aging, and breast and prostate cancers.

120.627.81 Stem Cells and the Biology of Aging and Disease (3 credits) TBD

The focus of this course will be on stem cell properties and on the biology of stem cells in the context of normal development, aging, tissue homeostasis, and disease settings including cancer. Also emphasized are the potential application of stem cells to the treatment of human disease, and current literature.

180.601.81 Environmental Health (5 credits)

Examines health issues, including scientific understanding of causes and possible future approaches to control of the major environmental health problems in industrialized and developing countries. Topics include how the body reacts to environmental pollutants; physical, chemical, and biological agents of environmental contamination; vectors for dissemination (air, water, soil); solid and hazardous waste; susceptible populations; biomarkers and risk analysis; the scientific basis for policy decisions; and emerging global environmental health problems. Students will learn how to identify and define the steps in the risk assessment process, including both exposure and dose-response assessment, and the sources and magnitude of uncertainty, as well as specific genetic factors (including gender- and ethnicity-related factors), physiologic factors (including age- and health status-related factors), and psychosocial factors (including SES- and social/cultural-related factors) that influence the risk of exposure and/or the likelihood of developing adverse health outcomes from exposure to environmental agents.

183.631.81 Fundamentals of Human Physiology (4 credits)

Encompasses the integration of a variety of organ systems. Invites leading scientists in different fields of physiology to offer exceptional and up-to-date lectures that quickly move through the basic mechanistic principles. Applies basic mechanistic principles of each organ system to current public health issues and environmentally relevant topics.

187.610.81, Public Health Toxicology (4 credits)

Examines basic concepts of toxicology as they apply to environmental health. It discusses distribution, cellular penetration, metabolic conversion, and elimination of toxic agents, as well as the fundamental laws governing the interaction of foreign chemicals with biological systems. The course focuses on the application of these concepts to the understanding and prevention of mortality and morbidity resulting from environmental exposure to toxic substances.

187.632.81 Molecular Toxicology (4 credits) TBD

Reviews the mechanisms by which environmental toxicants cause chronic diseases such as cancer, COPD, asthma and heart diseases that impact public health. Topics include cell signaling pathways involved in oxidative and nitrosative stress, cell growth, cell death, DNA repair, inflammation and carcinogenesis in response to exposure to air pollutants, metals and other environmental toxicants. Presents most recent technological advances in the molecular and genetic tools available to study how environmental toxicants cause diseases, which includes omics technologies (genomics, proteomics and metabolomics), next-generation sequencing for gene expression and genetic variations, transgenic animals and emerging alternative animal models.

260.611.81 Principles of Immunology (4 credits) TBD

Introduces biological concepts of immunology; molecular nature of antigens; molecular basis for antibody and T-cell receptor structure and diversity; complement; hypersensitivity reactions; cellular basis for the immune response; cell-mediated immunity; adhesion molecules and co-receptors cell activation; cytokines and other soluble mediators; major histocompatibility complex (MHC) antigens; tumor immunology; transplantation immunobiology; mechanisms of resistance to microorganisms; tolerance; autoimmunity; and immuno-deficiency

260.656.81 Malariology (4 credits)

Presents issues related to malaria as a major public health problem. Emphasis is on the biology of malaria parasites and factors affecting their transmission to humans by anopheline vectors. Topics include host-parasite-vector relationships; diagnostics; parasite biology; vector biology; epidemiology; host immunity; risk factors associated with infection, human behavior, chemotherapy, and drug resistances; anti-vector measures; vaccine development; and management and policy issues.

Appendix B

Evidence of Compliance with the Principles of Good Practice (as outlined in COMAR 13B02.03.22C)

(a) Curriculum and Instruction

- (i) **A distance education program shall be established and overseen by qualified faculty.**

The proposed program will be offered by the Johns Hopkins Bloomberg School of Public Health (JHSPH) with active participation by the Departments of Biochemistry and Molecular Biology, Environmental Health Sciences, and Molecular Microbiology and Immunology, and facilitated by the JHSPH Center for Teaching and Learning (CTL). CTL offers an array of evidence-based programs and services that support innovative teaching methods that encourage critical thinking skills online. Faculty experts will lead and support the development of online courses. Most of the faculty instructors have had previous experience teaching online. All have volunteered to have their ongoing or new courses as part of the new MA in Public Health Biology program.

- (ii) **A program's curriculum shall be coherent, cohesive, and comparable in academic rigor to programs offered in traditional instructional formats.**

All online courses will adhere to CTL's formal course development process with support from experienced instructional designers. Online coursework will follow well-established curriculum development standards, tailoring delivery methods, content, and assessments to learning objectives. Randomized empirical research suggests that an online course can be as rigorous, effective, and well received as an onsite version of the same course. Each term the School compares student course evaluations for onsite and online courses; these comparisons consistently yield very similar results.

- (iii) **A program shall result in learning outcomes appropriate to the rigor and breadth of the program.**

The program learning outcomes (competencies) are derived from input from professionals within the discipline, the program faculty, program leadership, and other program stakeholders, and are reviewed by the School's Committee on Academic Standards. The desired program outcomes are identical to those achieved in onsite programs.

- (iv) **A program shall provide for appropriate real-time or delayed interaction between faculty and students.**

The proposed program will be delivered via CoursePlus, the School's course delivery and management system. This platform supports both asynchronous and synchronous interaction among faculty, students, teaching assistants, and technical support staff. Students, faculty and others will be able to participate in real-time interaction through web-conference office hours and live chats, supported by JHU's Adobe Connect platform.

- (v) Faculty members in appropriate disciplines in collaboration with other institutional personnel shall participate in the design of courses offered through a distance education program.**

Faculty members are selected based on domain expertise, program-related teaching experience, and completion of required course development training. Faculty will be fully supported by CTL experts.

(b) Role and Mission

- (i) A distance education program shall be consistent with the institution's mission.**

Please see section A.1 of the proposal.

- (ii) Review and approval processes shall ensure the appropriateness of the technology being used to meet a program's objectives.**

All the courses in the program are designed with the support of an instructional designer, multimedia producers, and web specialists. These individuals assist in identifying and recommending the most effective learning technologies for achieving the course learning objectives. The course instructor and instructional designer create a Course Design Matrix that identifies the learning components of the course and how the course will be facilitated to achieve optimal student learning outcomes. This iterative process goes through several levels of review, including approval by the Committee on Academic Standards, prior to course production. The CTL design team continually monitors courses and consults with the instructors to make adjustments, if needed. All new online courses participate in a midterm and end-of-term course evaluation process. The midterm feedback is used to determine if any mid-term adjustments are needed. The end-of-term feedback is used to assess whether further course refinements are needed prior to the next time the course is offered.

(c) Faculty Support

- (i) An institution shall provide for training for faculty who teach with the use of technology in a distance education format, including training in the learning management system and the pedagogy of distance education.**

The program is supported by CTL which offers a number of opportunities and resources for faculty instructors and teaching assistants to become more familiar with online teaching systems and best pedagogical practices. In addition to maintaining an extensive catalog of resources on these topics (an online Teaching Toolkit), CTL regularly offers events, workshops, and one-on-one office hours to introduce and provide updates on the latest advances in teaching technology and pedagogy. In addition to one-on-one guidance from an instructional designer, all faculty will participate in an online teaching orientation session and receive a reference manual to support their teaching.

- (ii) Principles of best practice for teaching in a distance education format shall be developed and maintained by the faculty.**

Prior to teaching their first courses, all new online instructors will be required to participate in training that conveys, among other things, principles of best practices in online education. The principles will also be described in the above noted reference manual.

- (iii) An institution shall provide faculty support services specifically related to teaching through a distance education format.**

JHSPH, through CTL, maintains an innovative course management system and provides faculty support and training for distance education through a staff of more than 30 individuals who specialize in instructional design, audio production, technical writing, web development, production management and quality control.

- (d) An institution shall ensure that appropriate learning resources are available to students including appropriate and adequate library services and resources.**

The Johns Hopkins University library system includes The William H. Welch Medical Library in the School of Medicine, the Abraham M. Lilienfeld Library in the School of Public Health, and the Milton S. Eisenhower Library on the Homewood campus. Most periodicals, including more than 13,000 journal subscriptions and multiple databases and catalogs, are available to University Faculty, staff and students online from any location in the world. The interlibrary loan department also makes the research collection of the nation available to faculty and students. The libraries offer a variety of instructional services, including electronic classrooms designed to explain the library resources available for research and scholarship. Students have access to all libraries and library informationists.

- (e) Students and Student Services**

- (i) A distance education program shall provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and costs and payment policies.**

JHSPH maintains numerous web-based resources to inform prospective students on the information they may need as an online student. These resources include the JHSPH main website and the JHSPH online catalog. These include detailed programmatic information, academic support services, financial aid, costs, policies, and specific information for online learning. As new online students are admitted and enrolled, they receive timely emails with important information to help them prepare to become an online student. These emails include information on how to create their JHU login account for the course management systems, technical requirements, available academic support services and new online student orientation course.

- (ii) **Enrolled students shall have reasonable and adequate access to the range of student services to support their distance education activities.**

JHSPH online students have access to the following academic support services:

Academic Advising. Students are assigned an advisor when accepted. Students work individually with the advisor to develop a course of study that meets the requirements of the program and the career goals of the student. The advisor regularly contacts the students to check on progress and answer questions. Courses that deviate from the program plan and have not been approved by an adviser may not count toward degree requirements. A degree audit tool is provided so students verify their selections match degree requirements.

- *Library Services.* Students have online access to the The William H. Welch Medical Library in the School of Medicine, the Abraham M. Lilienfeld Library in the School of Public Health, and the Milton S. Eisenhower Library on the Homewood campus. The interlibrary loan department allows students access to resources at any other university in the nation. The library also provides easy access to a wide selection of electronic information resources, including the library's online catalog, and numerous electronic abstracting and indexing tools. Many of the databases are accessible remotely. Librarians are available to assist students remotely and the library maintains an extensive web site to take visitors through all its services and materials.
- *Services for Students with Disabilities.* The Johns Hopkins University is committed to making all academic programs, support services, and facilities accessible to qualified individuals. Students with disabilities who require reasonable accommodations can contact the JHSPH Office of Disability and Support Services.
- *Johns Hopkins Student Assistance Program.* The Johns Hopkins Student Assistance Program (JHSAP) is a professional counseling service that can assist students with managing problems of daily living. Stress, personal problems, family conflict, and life challenges can affect the academic progress of students. JHSAP focuses on problem solving through short-term counseling. Accessing the service is a simple matter of a phone call to arrange an appointment with a counselor. Online students may call a phone number for consultation and will be directed to the appropriate resource or office. JHSAP services are completely confidential. The program operates under State and Federal confidentiality legislation and is HIPAA compliant.
- *Transcript Access.* Students receive their grades through electronic access. Official transcripts will be mailed upon written request of the student at a nominal charge.
- *Student ID Card.* The University issues each student a Johns Hopkins Enterprise ID (JHED ID) and the School issues a JHSPH ID. The JHED ID grants students a JHU email address and secure access to many online services including course registration, bill payment, official grades, library services, and the online learning

platform CoursePlus. Students are also issued a JHSPH ID that provides access to the School's intranet (My JHSPH) where students can locate additional resources including research and administrative tools as well as the School's policy and procedures manual.

(iii) Accepted students shall have the background, knowledge, and technical skills needed to undertake a distance education program.

All accepted online students are required to have met the admission requirements stated for the degree program. New online students are required to complete the "Introduction to Online Learning" course prior to beginning their first online course. This course covers a broad range of topics on how to be a successful online student including online student learning expectations, and how to participate in online discussions.

(iv) Advertising, recruiting, and admissions materials shall clearly and accurately represent the program and the services available.

All relevant program information is kept up to date on the JHSPH web site www.jhsph.edu.

(f) Commitment to Support

(i) Policies for faculty evaluation shall include appropriate consideration of teaching and scholarly activities related to distance education programs.

Faculty who teach online courses are strongly encouraged to participate in one or two professional development opportunities annually to improve their online teaching skills. Teaching online is viewed no differently than teaching onsite for promotion purposes.

(ii) An institution shall demonstrate a commitment to ongoing support, both financial and technical, and to continuation of a program for a period sufficient to enable students to complete a degree or certificate.

JHSPH has a commitment to online teaching as demonstrated by the resources of its Center for Teaching and Learning (CTL), which provides course development, instructional, and technical support to new and current faculty. See also Appendix D for detailed financial information regarding the proposed program.

(g) Evaluation and Assessment

(i) An institution shall evaluate a distance education program's educational effectiveness, including assessments of student learning outcomes, student retention, student and faculty satisfaction, and cost-effectiveness.

See section L of the main proposal.

- (ii) An institution shall demonstrate an evidence-based approach to best online teaching practices.**

The Center for Teaching and Learning continually participates in professional development activities to keep abreast of evidence-based approaches to online teaching practices. These online teaching practices are then incorporated into the new online instructor training sessions.

- (iii) An institution shall provide for assessment and documentation of student achievement of learning outcomes in a distance education program**

As part of the online course design process, course assessments are required to be aligned with stated courses learning objectives. The proposed program will incorporate authentic assessments that demonstrate students' application of learned skills. Program faculty have experience with developing individual and collaborative assessments for measuring the acquisition of relevant knowledge and skills through online learning.

Appendix C

Faculty

Faculty	Title/Academic Rank	Status	Course
Agre, Peter MD	Bloomberg Distinguished Professor, Department of Molecular Microbiology and Immunology; Director, Johns Hopkins Malaria Institute	Full-Time	Perspectives on Research in Public Health
An, Steven PhD	Associate Professor, Department of Environmental Health Sciences	Full-Time	Fundamentals of Human Physiology
Bailey, Scott Phd	Associate Professor, Department of Biochemistry and Molecular Biology	Full-Time	Molecular Biology
Biswal, Shyam PhD	Professor, Department of Environmental Health Sciences	Full-Time	Molecular Toxicology
Bressler, Joseph PhD	Associate Professor, Department of Environmental Health Sciences	Full-Time	Environmental Health
Bryant, Randy PhD	Professor, Department of Biochemistry and Molecular Biology	Full-Time	Biochemistry
Celentano, David ScD	Professor and Chair, Department of Epidemiology	Full-Time	Epidemiologic Inference in Public Health I
Deal, Jennifer PhD	Assistant Scientist, Department of Epidemiology	Full-Time	Epidemiologic Inference in Public Health I
Jacobs-Lorena, Marcelo PhD	Professor, Department of Molecular Microbiology and Immunology	Full-Time	Public Health Perspectives on Research
Ketner, Gary PhD	Professor, Department of Molecular Microbiology and Immunology	Full-Time	Public Health Perspectives on Research
Korch, George PhD	Visiting Professor	Part-time	Public Health Biology I
McGready, John PhD	Associate Scientist, Department of Biostatistics	Full-Time	Statistical Reasoning I and II

Faculty	Title/Academic Rank	Status	Course
Platz, Elizabeth ScD	Professor, Deputy Chair of Department of Epidemiology	Full-Time	Epidemiologic Inference in Public Health I
Scott, Al PhD	Professor, Department of Molecular Microbiology and Immunology	Full-Time	Principles of Immunology
Sullivan, David MD	Professor, Department of Molecular Microbiology and Immunology	Full-Time	Public Health Biology I; Malariology
Tang, Winnie PhD	Assistant Professor, Department of Environmental Health Science	Full-Time	Molecular Toxicology
Tankersley, Clarke PhD	Professor, Department of Environmental Health Sciences	Full-Time	Fundamentals of Human Physiology
Trush, Michael PhD	Professor, Department of Environmental Health Sciences	Full-Time	Public Health Toxicology
Yager, James PhD	Professor, Department of Environmental Health Sciences	Full-Time	Public Health Toxicology
Zirkin, Barry PhD	Professor, Department of Biochemistry and Molecular Biology	Full-Time	Public Health Biology; Stem Cells and the Biology of Aging and Disease; Reproductive Biology

Appendix D

Finance Information

TABLE 1: RESOURCES					
Resource Categories	2016	2017	2018	2019	2020
1. Reallocated Funds	-	-	-	-	-
2. Tuition/Fee Revenue (c + g below)	\$177,480	\$365,400	\$564,840	\$581,580	\$599,400
a. Number of F/T Students	-	-	-	-	-
b. Annual Tuition/Fee Rate	-	-	-	-	-
c. Total F/T Revenue (a x b)	-	-	-	-	-
d. Number of P/T Students	10	20	30	30	30
e. Credit Hour Rate	\$986	\$1,015	\$1,046	\$1,077	\$1,110
f. Annual Credit Hour Rate	18	18	18	18	18
g. Total P/T Revenue (d x e x f)	\$177,480	\$365,400	\$564,840	\$581,580	\$599,400
3. Grants, Contracts & Other External Sources	-	-	-	-	-
4. Other Sources	-	-	-	-	-
TOTAL (Add 1 – 4)	\$177,480	\$365,400	\$564,840	\$581,580	\$599,400

Resources narrative:

1. Reallocated Funds: No reallocation of existing resources will be required.
2. Tuition and Fee Revenue: Projected revenue is based on an incoming class of 10 students, with total class size projected to increase by 10 students each year. Tuition is projected to increase by 3% annually.
3. Grants and Contracts: No grant or contract support is anticipated.
4. Other Sources: No other sources are anticipated.

TABLE 2: EXPENDITURES:					
Expenditure Categories	2016	2017	2018	2019	2020
1. Faculty (b + c below)	\$141,795	\$215,315	\$322,780	\$332,463	\$342,437
a. # Sections offered	-	-	-	-	-
b. Total Salary	\$105,424	\$160,086	\$239,985	\$247,185	\$254,600
c. Total Benefits	\$36,371	\$55,229	\$82,795	\$85,279	\$87,837
2. Admin. Staff (b + c below)	\$74,268	\$76,496	\$78,791	\$81,155	\$83,589
a. # FTE	0.25	0.25	0.25	0.25	0.25
b. Total Salary	\$55,424	\$57,087	\$ 58,799	\$60,563	\$62,380
c. Total Benefits	\$18,844	\$19,409	\$19,992	\$20,591	\$21,209
3. Support Staff (b + c below)	\$8,742	\$9,005	\$9,275	\$9,553	\$9,840
a. # FTE	0.1	0.1	0.1	0.1	0.1
b. Total Salary	\$6,500	\$6,695	\$6,896	\$7,103	\$7,316
c. Total Benefits	\$2,242	\$2,310	\$2,379	\$2,450	\$2,524
4. Equipment	-	-	-	-	-
5. Library	-	-	-	-	-
6. New or Renovated Space	-	-	-	-	-
7. Other Expenses	\$70,000	\$70,000	\$70,000	\$70,000	\$70,000
TOTAL (Add 1 – 7)	\$294,805	\$370,816	\$480,846	\$493,171	\$505,866

Expenditures narrative:

1. Faculty: Includes total salary and benefits for faculty teaching and developing content for the program. The benefits rate is 34.5%.
2. Administrative: Includes the cost for faculty director (at 25% effort). The benefits rate is 34.5% for full-time personnel.
3. Support Staff: Includes the cost for program coordinator (at 10% effort) and teaching assistants. The benefits rate is 34.5% for full-time personnel.
4. Equipment: No additional equipment is needed for the proposed program
5. Library: No additional library resources are needed for the proposed program.
6. New or Renovated Space: No additional space is needed for the proposed program.
7. Other Expenses: Includes instructional supplies, materials, development cost for online instruction and teaching assistants.