

MS Entomology – Vector Biology Curriculum

TOTAL MINIMUM PROGRAM CREDITS		60
CORE ENTOMOLOGY/VECTOR BIOLOGY COURSES		TOTAL CREDITS: 16
Introduction to Disease Vectors (ENTOM 4520 + lab)	FALL ONLY	4 credits
Insect Biology (ENTOM 2120 + lab)	FALL ONLY	4 credits
Professional Development in Entomology (ENTOM 7670)	FALL ONLY; must be taken first semester	2 credits
Vector Biology in Practice (New ENTOM)	FALL and SPRING	2 credits
Toxicology of Insecticides (ENTOM 4900 + lab)	SPRING ONLY	4 credits
CORE PUBLIC HEALTH COURSES		TOTAL CREDITS: 18
Public Health Foundations I (VTPMD 6101)	FALL ONLY	3 credits
Epidemiology in Practice (VTPMD 6104)	FALL ONLY	3 credits
Biostatistics for Health Sciences (VTPMD 6105)	FALL ONLY	3 credits
Public Health Foundations II (VTPMD 6102)	SPRING ONLY	3 credits
Public Health Ethics & Leadership (VTPMD 6103)	SPRING ONLY	3 credits
Principles of Infectious Disease for Public Health (VETMI 6111) – taken with VETMI 6112	FALL ONLY	2 credits
Cases in Infectious Diseases & Health (VETMI 6112) – taken with VETMI 6111	FALL ONLY	1 credit
RESEARCH/THESIS COURSES		TOTAL CREDITS: 18
Capstone Seminar in Vector-borne Disease (New ENTOM)		2 credits
ENTOM 8900 Masters level thesis research		16 credits (minimum)
ELECTIVE COURSES		AVAILABLE CREDITS: 25
Seminar in Ecology & Evolution of Infectious Diseases (ENTOM 6900)	FALL AND SPRING	1 credit
Public Health Microbiology (BIOMI 2500)	FALL ONLY	3 credits
Principles of Virology (BIOMI 4090)	FALL ONLY	3 credits
Microbiology of Human Contagious Diseases (BIOMI 2600)	SPRING ONLY	3 credits
Global Health Economics and Policy (PAM 4140)	FALL ONLY	3 credits
Medical Parasitology (BIOMI 4310)	FALL ONLY	2 credits
Insect Ecology (ENTOM 4550)	FALL ONLY	4 credits
Insect Physiology (ENTOM 4830)	SPRING ONLY	4 credits
Topical Seminar in Vector-borne Disease (New ENTOM)	FALL AND SPRING	2 credits

EXAMPLE COURSE OF STUDY

Fall Courses Y1	Credits	Spring Courses Y1	Credits
ENTOM 4520 + lab – Introduction to Disease Vectors (TR 10:10-11:25)	4	ENTOM 4900 + lab - Toxicology of Insecticides (TR 8:40-9:55 AM)	4
ENTOM 7670 – Professional Development in Entomology (W 4:30-7:30PM)	2	VTPMD 6102 – Public Health Foundations II (MW 10:10-11:25)	3
VTPMD 6101 – Public Health Foundations I (MW 10:00-11:30AM)	3	VTPMD 6103 – Public Health Ethics and Leadership (M12:30-3:30pm)	3
ENTOM 2120 + lab – Insect Biology (TR 9:05-9:55AM)	4	ENTOM 8900 - Masters level thesis research	2
ENTOM 8900 - Masters level thesis research	2	New ENTOM - Vector Biology in Practice	2
Elective (optional)	2 to 3	New ENTOM - Topical seminar (malaria)	2
<i>TOTAL CREDITS</i>	<i>15-18</i>	<i>TOTAL CREDITS</i>	<i>16</i>
SUMMER INTERNSHIP – 10 WEEKS			
Fall Courses Y2	Credits	Spring Courses Y2	Credits
VTPMD 6105 - Biostatistics for Health Sciences (TR 8:30-9:45AM)	3	ENTOM 8900 - Masters level thesis research	10
Vector Biology in Practice (new course ENTOMxxxx)	2	New ENTOM - Capstone Seminar in VBD	2
VTPMD 6104 - Epidemiology in Practice (TR 10:10-11:25AM)	3	Elective	3-4
ENTOM 8900 - Masters level thesis research	2		
VETMI 6111 - Principles of Infectious Disease for Public Health (MW 9:05-9:55AM)	2		
VETMI 6112 - Cases in Infectious Diseases & Health (F 9:05-9:55AM)	1		
Elective	2-3		
<i>TOTAL CREDITS</i>	<i>15-16</i>	<i>TOTAL CREDITS</i>	<i>15 to 16</i>

CORE ENTOMOLOGY COURSE DESCRIPTIONS

Introduction to Disease Vectors + lab	ENTOM 4520 + LAB	4 credits	FALL
<p>This course introduces vector taxonomy, evolution, biology, behavior, and the history of vector-borne disease control, with an emphasis on the Northeast USA. Some lectures will be taught by NEVBD collaborators and experts in vector control/public health via video link. Through a series of lectures and active learning projects, students will gain knowledge of the latest surveillance approaches, control methods, and challenges for controlling vector-borne diseases, which they will explore in greater detail through subsequent course offerings. In this course, students will gain an understanding of arthropod biology, body plan, organ systems, behavior and physiology, infection biology and immunity. Students will also gain practical skills with arthropod identification and demonstrate a solid understanding of disease vector evolutionary relationships. In addition, students will learn how to apply knowledge gained from the class in future roles as public health practitioners, or simply as informed citizens.</p>			
Prerequisites: N/A			
Insect Biology + lab	ENTOM 2120 + LAB	4 credits	FALL
<p>Introduces the science of entomology, focusing on the systematics, anatomy, physiology, basic and applied ecology, and natural history of insects. Early fall laboratories include field trips to collect and study insects in the natural environment. A personal collection emphasizing ecological, behavioral, and taxonomic categories is a requirement of the laboratory.</p>			
Prerequisites/Co-Requisites: One semester of college biology or permission of instructor.			
Professional Development in Entomology	ENTOM 7670	2 credits	FALL
<p>This is a graduate level seminar required of, and limited to, first semester graduate students in the Field of Entomology. The content focusses on professional development skills, including critical reading of scientific literature, oral and written presentation, and grant writing.</p>			
Prerequisites: Enrollment limited to graduate field of Entomology.			
Toxicology of Insecticides + lab	ENTOM 4900	4 credits	SPRING
<p>History, metabolism, and mechanism of action of genetically modified, synthetic, and naturally occurring insecticides. Discusses insecticide resistance, resistance management, and new approaches to insect control with genetically modified organisms.</p>			
Prerequisites: General chemistry course.			

CORE PUBLIC HEALTH COURSE DESCRIPTIONS

Public Health Foundations I	VTPMD 6101	3 credits	FALL
This course will introduce students to the history and role of public health, and will set the foundation of public health practice on the two guiding paradigms: the 10 essential public health functions, and the One Health/Planetary Health approach to public health prevention and problem solving. Students build their public health competency via investigating a breadth of public health issues, including both chronic and infectious disease, and the impact of our environment and climate on disease spread, acquisition, and impact.			
Prerequisites: Enrollment limited to graduate and professional students; seniors with permission of instructor.			

Public Health Foundations II	VTPMD 6102	3 credits	SPRING
This course will reinforce and expand upon learning from Public Health Foundations I by considering new cases and more complex public health issues. Students will further develop their public health competence by applying systems thinking to assess and address issues of public health importance.			
Prerequisites: Enrollment limited to graduate and professional students; seniors with permission of instructor.			

Public Health Ethics & Leadership	VTPMD 6103	3 credits	SPRING
This course will help build a student's professional toolkit such that they have the tools to enter the public health workforce and excel in leadership and management roles, including navigation of ethical situations and challenges. The course will introduce students to the key elements of leadership and professionalism, and will characterize the elements within the public health practice context via case studies, guest speakers, and a research paper.			
Prerequisites: Enrollment limited to graduate and professional students; seniors with permission of instructor.			

Epidemiology in Practice	VTPMD 6104	3 credits	FALL
This applied course will cover foundational concepts of epidemiology, including data collection, measures of disease frequency and association, diagnostic testing, bias, and study design.			
Co-Requisite: VTPMD 6105 or BRTY 6010.			

Biostatistics for Health Sciences	VTPMD 6105	3 credits	FALL
Teaches statistical concepts and application for health related data analysis. The course will relate health and biological sciences data back to Gaussian, non-Gaussian, Poisson, Binomial, and other distributions. Topics in descriptive statistics include summary measures, measure of association, concepts related to data distribution, and confidence intervals. Topics related to analytical analysis include categorical data, parametric and non-parametric population comparisons and correlation, and regression techniques. Students will be exposed to a variety of software packages, but will also be expected to calculate the simple statistical approaches as well. Emphasizes the understanding of statistical concepts and application and the structure of health data.			
Prerequisites: N/A			

Principles of Infectious Disease for Public Health	VETMI 6111	2 credits	FALL
This lecture-based course will cover the infectious agents important for public health, including the major viral, bacterial and parasitic agents in health and disease for humans, and involved in zoonosis from animals. The focus will be on the biology of the agent in the context of its transmission and possible countermeasures. <i>Best taken in conjunction with VETMI 6112.</i>			
Prerequisites: Undergraduate biology and chemistry suggested.			

Cases in Infectious Disease & Health	VETMI 6112	1 credit	FALL
This case-based course will focus on small group and applied learning. Subjects under discussion will cover the infectious agents important for public health, including the major viral, bacterial and parasitic agents in health and disease for humans, and involved in zoonosis from animals. <i>Best taken in conjunction with VETMI 6111.</i>			
Prerequisites: Undergraduate biology and chemistry suggested.			

SEMINAR COURSE DESCRIPTIONS

Vector Biology in Practice (new course)	ENTOMxxxx	2 credits	FALL AND SPRING
This seminar course will combine video interviews and lectures from experts in in the field, current topics discussions and hands on experience with laboratory/field methods.			
Prerequisites: N/A			

Seminars (new courses)	ENTOMxxxx	2 credits	FALL AND SPRING
These seminars will address special topics within Vector borne disease biology including Malaria, Lyme Disease, Arbovirology, etc.			
Prerequisites: N/A			

CAPSTONE AND THESIS COURSE DESCRIPTIONS

Thesis Independent Study in Entomology	ENTOM 8900	Variable credits	FALL AND SPRING
Thesis research conducted by M.S. students in the field of entomology with advice and consultation of a major professor who is a member of the field.			
Prerequisites: Permission of instructor required.			

Capstone Seminar in Vector-borne Diseases	ENTOM new course	2 credits	SPRING
Students will analyze their summer field experiences, discuss the final outcomes of their work and next steps.			
Prerequisites: N/A			

ELECTIVE COURSE DESCRIPTIONS

Seminar in Ecology & Evolution of Infectious Diseases	ENTOM 6900	1 credit	FALL/SPRING
Graduate-level discussion of the ecology, epidemiology, genetics, and evolution of infectious disease in animal and plant systems. Weekly discussion of research papers published in the primary scientific literature. Participation in discussion and presentation of at least one paper required for course credit.			
Prerequisites: N/A			

Principles of Virology	BIOMI 4090	3 credits	FALL
Covers principles of virology that will give a broad understanding of how viruses infect and cause disease. Topics include the classification of viruses, virus entry, genome replication and assembly, and virus pathogenesis. Particular emphasis is placed on virus-host cell interactions and common features between different viral families. Recommended for those planning to attend medical school, graduate school or Veterinary college, or just interested in what viruses are and how they cause disease.			
Prerequisites: BIOMI 2900 or permission of instructor. Recommended BIOMG 3300-BIOMG 3320, BIOMG 4320			

Public Health Microbiology	BIOMI 2500	3 credits	FALL
This course will use a variety of teaching methods (including historical and current case studies and databases) to help students understand basic principles of microbiology as they apply to the emergence, transmission, pathogenicity, and control of infectious human disease. Major topics include water and food borne disease, zoonotic diseases, sexually transmitted diseases and antibiotic resistance.			
Prerequisites: Equivalent of two semesters of majors-level biology and one semester general chemistry.			

Microbiology of Human Contagious Diseases	BIOMI 2600	3 credits	SPRING
This course provides an introduction to the microbiology of microbial diseases. The primary focus is on molecular mechanisms of pathogenesis, including detection of the host environment, binding of pathogenic microbes to host cell surfaces and their invasion of host cells and tissues, and the delivery and functions of microbial toxins. It will include host defenses and microbial countermeasures against these defenses. We will also study the evolution of pathogens and the co-evolution of their hosts.			
Prerequisites: One semester of introductory biology or equivalent			

Global Health Economics and Policy	PAM 4140	3 credits	Fall
This course has two objectives: 1) To explore how Economics can be used to understand global health, and 2) to provide tools and skills for understating global health policy. I emphasize economic models, scientific understating of diseases and the use of quantitative tools for the assessment of global health issues.			
Prerequisites: PAM 2101 or equivalent			

Medical Parasitology	BIOMI 4310	2 credits	Fall
Systematic study of arthropod, protozoan, and helminth parasites of public health importance, with emphasis on epidemiologic, clinical, and zoonotic aspects of these parasitisms.			
Prerequisites: Any of the following: BIOEE 1610, BIOEE 1780, BIOEE 2070, BIOEE 2640, BIOEE 2670, BIOEE 2740; NS 2750; BIOMI 2900, BIOMI 3970; EAS 1700; BIOG 1105, BIOG 1106, or one semester college-level biology or majors-level biology or equivalent course.			

Inset Ecology + lab	ENTOM 4550	4 credits	Fall (alternate years)
You will learn to think like an ecologist by studying the fundamental principles of insect ecology and the types of questions ecologists ask, seeing how ecology can be used to understand and solve environmental problems, and putting this knowledge into action during group activities in the lab and field.			
Prerequisites: Introductory biology or permission of instructor recommended			

Inset Physiology + lab	ENTOM 4830	4 credits	Spring
Introduction to the often unique ways in which insects have met their basic needs. Examines each organ system with emphasis on basic principles and specific examples. Also introduces students to some common methods used in physiological research and to the critical reading of scientific literature.			
Prerequisites: ENTOM 2120 or permission of instructor			

Students may choose additional electives if approved by the NEVBD advising team. Check the courses of study for classes. Other areas of interest may be marketing or communication.