

**Course Rubric:** IB 481

**Course Title:** Biology of Disease Vectors

**Instructors:**

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**Lecture:** MWF 12:00-12:50; NHB 2083

**Lab:** Wed 1:00-3:50; NHB 4072

**Office Hours:** Online via course website and by appointment

**Website:** <https://moodle.life.illinois.edu/>

**Grading:**

Exam 1 20%

Exam 2 20%

Laboratory 30%

In-Class Exercises/Final Project 30%

**Course Description:** Welcome to Biology of Disease Vectors! This course will cover a wide range of topics related to the biology of vector-borne diseases and their effects on human and animal health. A variety of in-class exercises will be utilized to help you develop these skills and enhance learning. One of the primary educational objectives of this course is to provide students with new or improved skills that may be broadly applicable in a variety of career fields (we are under no illusions that the majority of you will become medical entomologists). Thus, many class and lab exercises are designed to not only enhance cognitive skills (e.g., critical thinking) but also to introduce you to tools that will have value in many other disciplines. Several lab exercises will revolve around utilizing tools with broad applications to a variety of career choices in the sciences (e.g., molecular assays, spatial analysis, mathematical modeling, etc.).

**Prerequisites:** None. IB 481 is a 4-credit elective and meets the requirement for an upper-level laboratory course for the Integrative Biology major.

**Lectures and In-Class Exercises:** Lectures and In-Class Exercises will be 12:00-12:50 MWF in NHB 2083. Traditional format lectures with brief discussion exercises or activities will be presented on Mondays and Wednesdays. Fridays will be spent on full lecture period in-class activities devoted to resolving problems/challenges in vector-borne diseases. Students working in groups are expected to bring a laptop computer or tablet to Friday classes to develop a media product or presentation that will be submitted for a grade.

**Final Project:** A team project on a topic related to prevention or mitigation of vector-borne diseases will be developed over 5 lecture periods. Teams will develop a presentation based on their research and work that will be submitted for a grade.

**Laboratory:** Lab section will meet 1:00-3:50 W in NHB 4072. Labs will consist of paper discussions, identification of vector arthropods, field and lab exercises, and a variety of other activities. Students are expected to read the assigned reading in its entirety prior to the meeting of lab section.

**Readings:** Readings for discussions will be assigned from the primary literature and should be read in their entirety. There will also be reading assignments for the lab section from other resources (see syllabus for details) to prepare students for field trips and other exercises. No textbook is required.

**Discussions:** Group discussion of a paper from the primary literature will take place most weeks during the lab section. When “Discussion” is indicated on the syllabus, at the beginning of lab all students must turn in a one-page critique and three discussion questions (all typed on one sheet) that arose from reading of the paper and be prepared to discuss any aspect of the assigned reading. Assigned readings for which a critique should be prepared appear in *italics* on the class syllabi.

**Student Learning Outcomes:** Desired student learning outcomes include using critical thinking skills and quantitative reasoning to solve problems, reading and evaluating primary scientific literature, working collaboratively, developing an applied understanding of modern molecular and spatial analysis tools, and critically evaluating science-related news and information.

**Class Website:** A simple class website has been built using the Moodle course management system. All important materials associated with the class can be found on this website, including an up-to-date syllabus and pdfs of all assigned readings. There is also an online discussion forum, where students can post questions related to class materials or events and expect a quick response from the instructor, TA, or fellow students. Grades and class announcements will also be posted/accessible via the course website.

**Exams:** Two written exams will be used to evaluate knowledge attained during in-class group discussions and lectures. The exams will consist of multiple choice and open-format written responses to several provided exam questions. The exams will be taken during class. Two lab practicals will be used to evaluate knowledge attained during lab exercises and discussions. They will consist of providing insect identifications (from specimens studied in lab exercises) and open-format written responses to several questions related to assigned readings and discussions. The lab practicals will be taken during lab.

**Bonus Credit:** Students who wish to increase their final grade can do so in several ways.

- For one additional point (maximum) on final grade: Answer the “Index of Learning Styles” questionnaire (top link at [this page](#)) and e-mail printed page of results - with your name on results page - no later than Wednesday January 26<sup>th</sup>, 2022 to instructors and teaching assistant.
- For one additional point (maximum) on final grade: If you find an error in the syllabus or other course materials, notify instructors via e-mail before or no later than Wednesday May 4<sup>th</sup>, 2022. Multiple error reports will not result in additional points (but you could tell a classmate about an error and they could submit for an additional point!)
- For one additional point (up to five) on final grade: On or before Wednesday April 27<sup>th</sup>, 2022, collect, identify to species, and contribute an appropriately-labeled organismal specimen of a vector or arthropod of public-health importance (e.g., fly, louse) to the UIUC Medical Entomology Teaching Collection and upload collection details to [iNaturalist](#) (one point given for each *distinct taxon* provided).
- For one to two additional points (maximum) on final grade: Write a publication-quality (e.g., free of grammatical/spelling errors and with a coherent flow and structure), 500-600 word popular science article on the US-based vector-borne disease of your choice – to receive credit for this, the instructors must be notified of the topic and intent to write an article via e-mail no later than 5:00pm (central) on Wednesday April 27<sup>th</sup>, 2022; receive a digital copy of the article rough draft no later than 5:00pm (central) on Friday May 6<sup>th</sup>, 2022; and receive a final version (w/any instructor edits/comments addressed) no later than 12:00pm (central) on Wednesday May 11<sup>th</sup>, 2022. Determination of either 1 or 2 bonus credit points made on quality of final product.

**Re-grades:** Students who wish to dispute an exam grade may submit their exam for a re-grade. However, the entire exam will be re-graded, with the potential outcome that the grade may go up, down, or stay the same. Re-grades must be submitted in class within one week of the return of the exam, and include both the original, unmodified exam and a concise, typed letter explaining the reason for the re-grade request.

**Make-up Exams:** Students with a legitimate excuse for missing an exam will be offered an opportunity to take a make-up exam at a time convenient for the instructors of the class. Make-up exams pose a considerable inconvenience to your instructors, so please make every reasonable effort not to miss a scheduled exam time. Students with a legitimate excuse for missing a laboratory discussion will be allowed to turn in their critique and discussion questions for the missed discussion points with instructor approval.

**Academic Integrity:** It is the expectation of the course instructors that students will conduct themselves with the utmost integrity and honesty and adhere to the guidelines of the UIUC Student Code. Students determined to be cheating on an exam will receive a grade of “0” for the exam and will receive a formal disciplinary letter. For more information, please see: <https://provost.illinois.edu/policies/policies/academic-integrity/students-quick-reference-guide-to-academic-integrity/>

**Disability Accommodations:** Students with disabilities who require assistance to participate in this class are asked to discuss any requested accommodations with the course instructor as soon as possible at the start of the semester.

**Grade Range:** A+ = 100, A/A- = 99-90; B+/B/B- = 89-80; C+/C/C- = 79-70; D+/D/D- = 69-60, F = 59 or below.

Week	Date	Class	Topic	Assigned Reading
1	1/19	Lecture	Introduction to Vector Biology and Vector-Borne Diseases	
		Lab 1	Orientation; Overview on the Classification & Structure of Arthropods	
	1/21	Lecture	Physiology of Disease Vectors and Pathogen Transmission Cycles	
2	1/24	Lecture	<i>Anopheles</i> spp. Mosquitoes and Malaria	
	1/26	Lecture	<i>Aedes</i> spp. Mosquitoes and Arboviruses	
		Lab 2 Discussion	Identification and Life Cycle of Mosquitoes (Anophelinae and Culicinae) “Beer Consumption Increases Human Attractiveness to Malaria Mosquitoes”	<i>Lefevre et al. 2010</i>
	1/28	Exercise	The global spread of <i>Aedes aegypti</i> and <i>Aedes albopictus</i>	Dusfour et al. 2019
3	1/31	Lecture	<i>Culex</i> spp. Mosquitoes and The Ecology of West Nile Virus	
	2/2	Lecture	Chemical Control and Mechanisms of Resistance	
		Lab 3 Discussion	Computer Lab: Mathematical modeling of vector-borne disease dynamics *Bring laptop to lab*	Biology of Disease Vectors: Chapter 15
	2/4	Exercise	The global spread of <i>Aedes aegypti</i> and <i>Aedes albopictus</i> presentations	
4	2/7	Lecture	Environmental and Biological Control	
	2/9	Lecture	Black-flies and River Blindness	
		Lab 4	Vector Control Methods “Shifting Priorities in Vector Biology to Improve Control of Vector-borne Disease”	<i>Lambrechts et al. 2009</i>
	2/11	Exercise	Public health announcements	Lwin et al. 2018
5	2/14	Lecture	Sand-flies and Leishmaniasis	
	2/16	Lecture	Biting Midges and Livestock/Wildlife Viruses	
		Lab 5 Discussion	Black-flies (Simuliidae), Sand-flies (Phlebotominae) and Biting midges (Ceratopogonidae) “Leishmaniasis and Poverty”	<i>Alvar et al. 2006</i>
	2/18	Exercise	Public health announcements presentations	
6	2/21	Lecture	Tsetse-flies and Sleeping Sickness	
	2/23	Lecture	Myiasis-producing Flies	
		Lab 6 Discussion	Tsetse-flies (Glossinidae) and Myiasis-producing flies “Maggot Therapy for Treating Diabetic Foot Ulcers”	<i>Sherman 2003</i>
	2/25	Exercise	Eradicate a vector-borne disease	Gebrezgabiher et al. 2019
7	2/28	Lecture	Qualitative and Quantitative Assays for Pathogens, Vectors, and Hosts	
	3/2		No Class	
		Lab 7	<b>Lab Practical 1</b>	
	3/4	Exercise	Eradicate a vector-borne disease presentations	
8	3/7	Lecture	Review Session for Exam 1	

	3/9		Exam 1	
		Lab 8 Discussion	Mosquito Dissection “Improving Vector-borne Pathogen Surveillance: A laboratory-based study exploring the potential to detect dengue virus and malaria parasites in mosquito saliva”	<i>Melanson et al. 2017</i>
	3/11	Lecture	TBA: Student Choice	
			<b>SPRING BREAK MARCH 12-20</b>	
9	3/21	Lecture	Fleas and The Plague	
	3/23	Lecture	Lice and Bacterial Diseases	
		Lab 9	Fleas (Siphonaptera) and Lice (Phthiraptera) “Genetic Analysis of Lice Supports Direct Contact between Modern and Archaic Humans”	<i>Reed et al. 2004</i>
	3/25	Lecture	Ancient Plagues: The Impacts of Vector-Borne Diseases on Human History	Adler and Wills 2003
10	3/28	Lecture	Triatomine Bugs and Chagas Disease	
	3/30	Lecture	The Bedbug Epidemic	
		Lab 10 Discussion	Triatomine bugs (Triatominae) and Bedbugs (Cimicidae) “Association of Anthropogenic Land Use Change and Increased Abundance of the Chagas Disease Vector”	<i>Gottdenker et al. 2011</i>
	4/1	Exercise	Introduction to final projects	
11	4/4	Lecture	Ticks and Tick-Borne Diseases	
	4/6	Lecture	Scabies, Trombiculids, and Chupacabra	
		Lab 11 Discussion	Soft ticks (Argasidae), Hard ticks (Ixodidae), Scabies mites (Sarcoptidae), and Scrub typhus mites (Trombiculidae) “Control of Ixodid Ticks and Prevention of Tick-borne Diseases in the United States: The prospect of a new Lyme disease vaccine and the continuing problem with tick exposure on residential properties”	<i>Eisen 2021</i>
	4/8	Exercise	Final project in-class team work day	
12	4/11	Lecture	Spatial analysis of vector-borne disease	
	4/13	Lecture	The Future of Vector Biology	
		Lab 12	Computer Lab: Spatial analysis of vector-borne disease dynamics *Bring laptop to lab*	Ostfeld et al. 2005
	4/15	Lecture	Review Session for Exam 2	
13	4/18		<b>Exam 2</b>	
	4/20	Exercise	Final project in-class team work day	
		Lab 13	Field Lab: Introduction to field techniques for the collection and surveillance of disease vectors *Field trip to Hart Woods*	Biology of Disease Vectors: Chapter 19
	4/22	Exercise	Final project in-class team work day	

14	4/25	Exercise	Final project in-class team work day	
	4/27		No Class	
		Lab 14	<b>Lab Practical 2</b>	
	4/29	Exercise	Final project in-class team work day	
15	5/2	Exercise	Final project presentations	
	5/4	Exercise	Final project presentations	