Syllabus for IB 504, Genomic Analysis of Insects, Spring 2019

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Course description. IB504 is designed to introduce graduate students, primarily in the Department of Entomology where the course is a core requirement for PhD students and optional for MS students, as well as selected undergraduates, to the molecular biology and genomics of insects and related arthropods. The course is divided into three parts. The first third concerns basic concepts in molecular biology and methods employed such as cloning, Southerns, Northerns, and Westerns, PCR, DNA sequencing, RNA interference, transformation, and CRISPR-cas9. The second third covers the basics of molecular genetics in the model insect the pomace fly *Drosophila melanogaster*, including mutagenesis, transposons, and four pivotal discoveries made with this fly: the genes involved in early development, sex determination, circadian rhythms, and chemoreception. The last third concerns application of molecular biological approaches to various other aspects of entomology, from molecular phylogenetics to pathogens, followed by an introduction to the features of the genomes and gene contents of the major insect orders, ending with approaches to population genetic/genomic analysis that provide insights into insect biology and ecology.

Credits. 3 hours

Prerequisites. An undergraduate course with some molecular genetic content.

Requirements that course meets. This is one of five required courses for Department of Entomology PhD candidates.

Frequency and duration. The class meets for 50 minute lectures three times a week, MWF 1:00-1:50 PM

Required text. Hugh used to use a text by Marjorie Hoy, quite useful at the beginning, but he felt the field had outgrown it in terms of the breadth of what's covered. Almost no genomics. If you really feel like you're struggling, you can get ed. 2 this for a few bucks online at Amazon and at least the first few chapters would help. Hoy, Marjorie A. *Insect molecular genetics: an introduction to principles and applications*. 4th edition. Elsevier, 2018.

Course grading. There are three exams covering the three parts of the course, each lasting on hour and counting for 50 points. Course grades include plus and minus, with the only fixed cutoff being that 80 percent or above is an A.

Attendance policy. Students are expected to attend lecture. Makeup exams are offered for official conflicts such as illness, absence from campus for attending a conference.

Disability accommodations. To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class are asked to see the instructor as soon as possible.

Academic integrity. It is the responsibility of each student to refrain from infractions of academic integrity, from conduct that may lead to suspicion of such infractions, and from conduct that aids others in such infractions. It is my responsibility as an instructor to uphold the academic integrity policy of the University, which can be found here: http://studentcode.illinois.edu/article1_part4_1-401.html

Student Learning Outcomes.
1. Gain a basic understanding of the concepts and methods of molecular biology and genetics of eukaryotes.
2. Understand some of the major discoveries using these methods with the pomace fly *Drosophila melanogaster*.
3. Apply these concepts and methods to various problems in entomology, including their own research interests, such as molecular phylogenetics or genomics.

Lecture schedule

Date	Lecture	Topic
Jan 14	1	Introduction; DNA replication
Jan 16	2	Transcription/translation
Jan 18	3	Prokaryotes
Jan 23 (SB out of town)	4	DNA isolation and gels
Jan 25 (SB out of town)	5	Cloning and libraries

Jan 28	6	Screening and Southerns
Jan 30	7	DNA sequencing and genomes
Feb 1	8	mRNA, cDNA, and ESTs
Feb 4	9	PCR
Feb 6	10	Microarrays
Feb 8	11	Proteins
Feb 11	12	Drosophila mutants
Feb 13	13	Drosophila genome 1
Feb 15	14	Transposable elements
Feb 18	15	P elements
Feb 20		FIRST EXAM
Feb 22	16	Use of P elements
Feb 25	17	Alcohol dehydrogenase
Feb 27	18	Developmental genes 1
Mar 1	19	Developmental genes 2
Mar 4	20	Homeotics
Mar 6	21	Sex determination
Mar 8	22	Circadian rhythms
Mar 11	23	Drosophila genome 2
Mar 13	24	Olfaction 1
Mar 15	25	Olfaction 2
Mar 18 -22		SPRING BREAK
Mar 25	26	Insecticide resistance
Mar 27	27	Baculoviruses
Mar 29	28	Wolbachia
Apr 1	29	Molecular phylogenetics
Apr 3		SECOND EXAM
Apr 5	30	Mosquito genomes
Apr 8	31	Moth and beetle genomes
Apr 10	32	Honey bee genome
Apr 12	33	Other arthropod genomes
Apr 15	34	RNA interference
Apr 17	35	Insect transformation
Apr 19	36	Insect applications
Apr 22 – Poly 1 - Berenbaum	37	p450s
Apr 24 – Polymorphisms 2	38	Allozymes and microsatellites
Apr 26 - Polymorphisms 3	39	Single Nucleotide Polymorphisms (SNPs)
Apr 29	40	Population genomics
May 1		THIRD EXAM