Syllabus for IB 504, Genomic Analysis of Insects, Spring 2021

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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 first part of the course concerns basic concepts in molecular biology and methods employed such as cloning, PCR, DNA sequencing, cloning, RNA interference, transformation, and CRISPR-cas9. The second part covers applications of genomic approaches to various aspects of entomology, from molecular phylogenetics to pathogens, 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. There is no required text. Students are provided with a full handout each lecture.

Course grading.
9 quizzes x 5 points each = 45 pts
1 midterm x 20 points (proctored)
1 final student presentation = 15 pts
Participation in case studies = 20 pts **TOTAL = 100 pts**

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 all lectures. 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: https://studentcode.illinois.edu

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 within the context of entomology.
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#
25-Jan	Introduction - orientation to course
27-Jan	DNA structure, DNA replication, Transcription
29-Jan	RNA, types of RNA
1-Feb	Techniques 1: Microarrays (Guest Lecture)
3-Feb	Gene expression: Translation
5-Feb	Gene structure and regulation

8-Feb	Techniques: DNA isolation and PCR
10-Feb	Techniques: Electrophoresis and Cloning
12-Feb	Discussion / Case studies
15-Feb	DNA sequencing 1
17-Feb	Break -- No Class
19-Feb	DNA sequencing 2
22-Feb	Mutations, reverse genetics
24-Feb	Techniques: CRISPR/Cas9 and RNAi
26-Feb	Discussion /Case studies
1-Mar	MIDTERM
3-Mar	Genome assembly
5-Mar	The honey bee genome
8-Mar	Techniques: Microarrays 2 and RT-qPCR
10-Mar	Applications: RNA-seq
12-Mar	Discussion / Case studies
15-Mar	Applications: Chip-seq
17-Mar	Applications: small-RNA sequencing
19-Mar	Discussion / Case studies
22-Mar	Phylogenomics
24-Mar	Break – No Class
26-Mar	Discussion / Case studies
29-Mar	Cytochrome P450s
31-Mar	Applications: Variant calling
2-Apr	Discussion / Case studies
5-Apr	Metagenomics, meta-transcriptomics
7-Apr	Microbiomes of insects
9-Apr	Discussion/ Case studies
12-Apr	Population genomics
14-Apr	Resequencing, RAD-seq, pool-seq
16-Apr	Discussion / Case study
19-Apr	Basic bioinformatics methods 1
21-Apr	Basic bioinformatics methods 2
23-Apr	Discussion / Case study
26-Apr	Student ppt
28-Apr	Student ppt
30-Apr	Student ppt
3-May	Student ppt
5-May	Student ppt