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

Contact information. Bernarda Calla, 216C Morrill Hall, calla2@illinois.edu

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
<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture#</th>
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<tbody>
<tr>
<td>25-Jan</td>
<td>Introduction - orientation to course</td>
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<tr>
<td>27-Jan</td>
<td>DNA structure, DNA replication, Transcription</td>
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<tr>
<td>29-Jan</td>
<td>RNA, types of RNA</td>
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<tr>
<td>1-Feb</td>
<td>Techniques 1: Microarrays (Guest Lecture)</td>
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<td>3-Feb</td>
<td>Gene expression: Translation</td>
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<tr>
<td>5-Feb</td>
<td>Gene structure and regulation</td>
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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