Overview

Course Description

Provides foundation knowledge of molecular biology, with emphasis on scientific discoveries from insects and nematodes. Presents information on the current innovations and trends of molecular technologies (e.g. high throughput sequencing, different types of omics, genome editing by CRISPR).

What is special about this course?

Do you know that …
- An insect (_Drosophila melanogaster_) and a nematode (_Caenorhabditis elegans_) have contributed to numerous groundbreaking discoveries and generated 15 Nobel laureates in the past century?
- Our knowledge of how cells develop into tissues, how innate immune system works, and how genes may affect behaviors such as smell, taste, even sleep, were profoundly advanced by studies on insects or nematodes?
- Scientists are constantly leveraging molecular tools to study and to control pests and disease vectors?

If your answer is “no” to any of the questions, or, if you are simply intrigued by the idea of studying molecular biology from an entomological or nematological perspective, **this course may be ideal for you!**

Learning Objectives

Upon completion of the course, students will be able to:
- Explain the central dogma and principles of molecular biology
- Distinguish between and describe molecular techniques
- Summarize the value of insect and nematode models in molecular biology research
- Analyze omics data
- Critique research findings.
- Summarize current applications of molecular technologies and propose new applications.
Prerequisite
Students must complete a college-level biology course, e.g., BSC2005 Biological Sciences, BSC2010 Integrated Principles of Biology 1, ABE 2062 Biology for Engineers, AGR 3303 Genetics, ANS 3006 Introduction to Animal Science, BCH 4024 Introduction to Biochemistry and Molecular Biology, ENY 2040 The Insects, ENY 3005 Principles of Entomology, or equivalent. If a student has taken a course not listed above but is interested in enrolling into this course, please consult with the instructor for reading materials.

Readings:
Optional textbook

Recommended readings
- *Other readings will be posted in the course Canvas website.*

Fall Schedule (tentative)

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Active learning exercises</th>
<th>Online quiz?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1 August 24</td>
<td>Course overview</td>
<td>- Self intro and news sharing</td>
<td>-</td>
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<tr>
<td>Week 2A August 29</td>
<td>M1.1 Introduction to DNA, RNA, and proteins</td>
<td>- Genome size game</td>
<td>Y</td>
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</tbody>
</table>
| Week 2B August 31 | M1.2 Gene regulation mechanisms (Part 1)  
- Replication, transcription and translation | - Game | |
| | Sep 5 | Holiday (Labor Day) | |
| Week 3 Sept 7 | M1.3 Gene regulation mechanisms (Part 2)  
- Epigenetic regulation | Case study | - |
| Week 4A Sept 12 | M 2.1 Genotype and phenotype (Part 1)  
- Mendel's Laws of Heredity and exceptions  
- Autosomal vs. sex-linked inheritance  
- Sex determination | - | Y |
| Week 4B Sept 14 | M 2.2 Genotype and phenotype (Part 2)  
- Development  
- Behavior | - | Y |
| Week 5A Sept 19 | 5.1 Drosophila as a model organism (Part 1)  
- Genetic tools in flies | - | - |
| Week 5B Sept 21 | 5.2 Drosophila as a model organism (Part 2)  
- Key discoveries | - | - |
| Week 6A Sept 26 | 6 C. elegans as a model organism | - | Y |
| Week 6B Sept 28 | 1st exam | | |
| Week 7A Oct 3 | 7.1 Molecular techniques on DNA/RNA (Part 1)  
- DNA and RNA extraction methods  
- PCR, real-time PCR, digital PCR  
- LAMP  
- Gene cloning | Group exercises | - |
<p>| Week 7B Oct 5 | 7.2 Molecular techniques on DNA/RNA (Part 2) | - | Y |</p>
<table>
<thead>
<tr>
<th>Week 8A</th>
<th>RNAi CRISPR</th>
<th>8. Highthroughput sequencing (Part 1)</th>
<th>Case study</th>
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<tbody>
<tr>
<td>Oct 10</td>
<td></td>
<td>• Illumina and Nanopore methods</td>
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<tr>
<td>Week 8B</td>
<td>RNAi CRISPR</td>
<td>8.2 Highthroughput sequencing (Part 2)</td>
<td>Group discussion Y</td>
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<tr>
<td>Oct 12</td>
<td></td>
<td>• Data analysis</td>
<td></td>
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<tr>
<td>Week 9A</td>
<td>RNAi CRISPR</td>
<td>9. Molecular techniques on proteins and metabolites</td>
<td>Class exercise Y</td>
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<tr>
<td>Oct 17</td>
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<tr>
<td>Week 9B</td>
<td>RNAi CRISPR</td>
<td>10. Single Cell Analysis</td>
<td>Plan a proposal -</td>
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<tr>
<td>Oct 19</td>
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<tr>
<td>Week 10A</td>
<td></td>
<td>Class exercises and pre-exam Q&amp;A</td>
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<tr>
<td>Oct 24</td>
<td></td>
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<tr>
<td>Week 10B</td>
<td></td>
<td>2nd exam</td>
<td></td>
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<tr>
<td>Oct 26</td>
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<tr>
<td>Week 11A</td>
<td></td>
<td>11.1 Critique molecular journal article 1</td>
<td>Group discussion -</td>
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<tr>
<td>Oct 31</td>
<td></td>
<td></td>
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<tr>
<td>Week 11B</td>
<td></td>
<td>11.2 Critique molecular journal article 2</td>
<td>Group discussion -</td>
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<tr>
<td>Nov 2</td>
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<tr>
<td>Week 12A</td>
<td></td>
<td>12.1 Omics data workshop Part 1</td>
<td>Group workshop -</td>
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<tr>
<td>Nov 7</td>
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<tr>
<td>Week 12B</td>
<td></td>
<td>12.2 Omics data workshop Part 2</td>
<td>Group workshop -</td>
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<tr>
<td>Nov 9</td>
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<tr>
<td>Week 13A</td>
<td></td>
<td>13 Guest lecture</td>
<td>- Y</td>
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<tr>
<td>Nov 14</td>
<td></td>
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<tr>
<td>Week 13B</td>
<td></td>
<td>14. Molecular applications</td>
<td>- Y</td>
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<tr>
<td>Nov 16</td>
<td></td>
<td></td>
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<tr>
<td>Week 14</td>
<td></td>
<td>No class (enjoy thanksgiving week!)</td>
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<tr>
<td>Week 15A</td>
<td></td>
<td>15. Group debate</td>
<td>Debate</td>
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<tr>
<td>Nov 28</td>
<td></td>
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<tr>
<td>Week 15B</td>
<td></td>
<td>16. Career panel discussion</td>
<td>Panel discussion</td>
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<tr>
<td>Nov 30</td>
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<tr>
<td>Week 16A</td>
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<td>General feedback on the course; Pre-exam Q&amp;A</td>
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<td>Dec 5</td>
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<td>Week 16B</td>
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<td>3rd exam</td>
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<td>Dec 7</td>
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### Course Policies

#### Grading
This course will be graded on the following scale:

- **A**: 93-100% of total points
- **A-**: 90-92.9% of total points
- **B+**: 87-89.9% of total points
- **B**: 83-86.9% of total points
- **B-**: 80-82.9% of total points
- **C+**: 77-79.9% of total points
- **C**: 73-76.9% of total points
- **C-**: 70-72.9% of total points
- **D+**: 67-69.9% of total points
- **D**: 63-66.9% of total points
- **D-**: 60-62.9% of total points
- **E**: <60% of total points

<table>
<thead>
<tr>
<th></th>
<th>Point amount</th>
<th>% Grade</th>
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<tbody>
<tr>
<td>Exams (3 in total)</td>
<td>300 in total (100 each)</td>
<td>40%</td>
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<tr>
<td>Quizzes (7 in total)</td>
<td>68 in total</td>
<td>20%</td>
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<tr>
<td>Group Debate (1 in total)</td>
<td>75</td>
<td>15%</td>
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For information on current UF policies for assigning grades, please visit:
Current website: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

General Class Rules
- Keep electronic devices in silence mode during lectures and lab exercises.
- Discussions about grades or other personal matters should be addressed during office hours.

Attendance and Make-Up Policies
Attendance is required. If you miss class, you are responsible for getting notes from other classmates. Excused absences must be consistent with university policies in the Graduate Catalog and require appropriate documentation. University policy for class attendance and make-up exams, assignments and other work can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Class Attendance and Online quizzes
Each lecture class will be 1 hour long, except for guest lectures that will be 45 mins long, followed by 15-min Q and A. There will be 7 quizzes posted on Canvas (indicated in the fall schedule table) to help students reinforce course materials and learning. Quizzes will be open book, consisting of multiple choices, true/false, and fill in the blank questions.

Active Participation in Class
Participation in class will be assessed through several in-class exercises

Journal discussion
Students will be divided into groups of three or four. Research articles covering different topics of molecular entomology or nematology and guiding questions will be distributed to the group via a social learning platform “Perusall” on Canvas.

Group debate
There will be a group debate exercise toward the end of the course. An instruction and grading rubric will be posted in Canvas 2 weeks prior to the exercise. Students will be divided into 3 groups – two debating teams and a group of judges. Each debating team will have 10 minutes to present their arguments in support of their position statement. After both teams have presented, they will have 5 minutes to generate questions/criticisms to challenge the opposing debate team. Each team will take turns to raise questions/criticisms, followed by answers/rebuttal from the opposing team. At the conclusion of the debate, each judge will provide 5-minutes of feedback. Debating teams can decide whether they want to respond to judge comments before the judges cast their votes. A key component of this exercise is peer assessment. Debating teams will be graded by the judges and instructor. Judges will be graded by the students for their in-class feedback and will have to submit a summary of the debate (summarize key points raised by both teams, and critique their debating techniques) to be graded by the instructor.

Exams
There will be three exams. The exams will be closed book and non-cumulative. Exam papers will consist of multiple-choice, true/false, and fill-in-the-blank questions in Part A, short answer questions and long answer questions in Part B.

Course Evaluation
Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide professional and respectful feedback on the quality of instruction in this course using a standard set of university and college criteria, by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at gatorevals.aa.ufl.edu/public-results/.

Academic Integrity and Class Rules
Each student in the course is expected to abide by the UF Code of Academic Integrity. For information, please visit:
https://sccr.dso.ufl.edu/students/student-conduct-code/
Academic Honesty
As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g., assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code.

Plagiarism
Plagiarism is a serious dishonesty act in academia, especially with the ease of obtaining information from the internet. Students must not represent the words or ideas of another person as one’s own without attribution to the source, unless they are considered common knowledge. Plagiarism includes but is not limited to:

- Quoting oral or written materials including but not limited to those found on the internet, whether published or unpublished, without proper attribution.
- Submitting a document or assignment which in whole or in part is identical or substantially identical to a document or assignment not authorized by the student.
- Unauthorized use of materials or resources.
- Prohibited collaboration or consultation.
- Submission of paper or academic work purchased or obtained for an outside source.

Plagiarism is unethical and unacceptable. UF Plagiarism Policy can be found: http://regulations.ufl.edu/chapter4/4041.pdf. The consequences for plagiarism while at the University of Florida range from receiving a zero grade for the plagiarized assignment, a fail grade for the course, to, expulsion from the university. Students who plagiarize will be caught and consequences will be applied. Written assignments will be checked using an anti-plagiarism software called Turnitin® (http://www.at.ufl.edu/~turnitin/about.html).

Software Use
All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Additional Resources

Services for Students with Disabilities
The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc

Campus Helping Resources
Health and Wellness

U Matter, We Care:
If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.
Counseling and Wellness Center: [counseling.ufl.edu/cwc](http://counseling.ufl.edu/cwc), and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Sexual Assault Recovery Services (SARS)**
Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or [police.ufl.edu](http://police.ufl.edu).

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**Academic Resources**

- [E-learning technical support](http://e-learningtechnicalsupport.com), 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
- **Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling.
- **Library Support**, Various ways to receive assistance with respect to using the libraries or finding resources.
- **Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring.
- **Student Complaints Campus**
- **On-Line Students Complaints**

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**Student Complaints**

- Residential Course: [https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf)