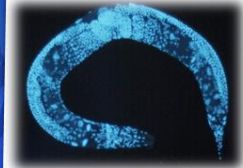
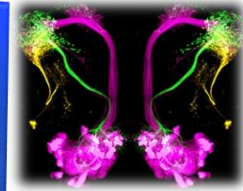


**Molecular Biology of  
Insects and Nematodes**

*“Let’s learn molecular biology  
through bugs and worms!”*



**ENY 4823/6406**  
3 credits, Fall

**Instructor: Dr. Adam CN Wong**

Room 3105, Steinmetz Hall, Bldg. 970, Natural Area Drive  
352-273-3977; adamcnwong@ufl.edu

**Class period:** Monday and Wednesday Period 6 - 7 (12:50 PM - 2:45 PM)

**Locations:** In person and by zoom

**Office hours:** Immediately after class and by appointment.

**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 entomo- or nemato- logical 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

- Marjorie A. Hoy: Insect Molecular Genetics: An Introduction to Principles and Applications (4th Edition). EBook is available from the UF library for students: Go to: <https://guides.uflib.ufl.edu/ebooks> and search the book under Library Catalog.

### Recommended readings

- Ganai, R. A., & Johansson, E. (2016). DNA replication—a matter of fidelity. *Molecular Cell*, 62(5), 745-755.
- Asgari, S. (2013). MicroRNA functions in insects. *Insect biochemistry and molecular biology*, 43(4), 388-397.
- Paliy, O., & Shankar, V. (2016). Application of multivariate statistical techniques in microbial ecology. *Molecular ecology*, 25(5), 1032-1057.
- Taning et al., (2017). CRISPR/Cas9 in insects: Applications, best practices and biosafety concerns. *Journal of Insect Physiology*. 98. 245-257.
- **Other readings will be posted in the course Canvas website.**

## Fall Schedule (tentative)

Week	Topic	Active learning exercises	Online quiz?
<b>Week 1</b> August 23	<b>Course overview</b>	- Self intro and news sharing	-
<b>Week 2A</b> August 28	<b>M1.1 Introduction to DNA, RNA, and proteins</b>	- Genome size game	Y
<b>Week 2B</b> August 30	<b>M1.2 Gene regulation mechanisms (Part 1)</b> <ul style="list-style-type: none"><li>• Replication, transcription and translation</li></ul>	- Game	
Sep 4	Holiday (Labor Day)		
<b>Week 3</b> Sept 6	<b>M1.3 Gene regulation mechanisms (Part 2)</b> <ul style="list-style-type: none"><li>• Epigenetic regulation</li></ul>	Case study	-
<b>Week 4A</b> Sept 11	<b>M 2.1 Genotype and phenotype (Part 1)</b> <ul style="list-style-type: none"><li>• Mendel's Laws of Heredity and exceptions</li><li>• Autosomal vs. sex-linked inheritance</li><li>• Sex determination</li></ul>	-	Y
<b>Week 4B</b> Sept 13	<b>M 2.2 Genotype and phenotype (Part 2)</b> <ul style="list-style-type: none"><li>• Development</li><li>• Behavior</li></ul>	-	Y
<b>Week 5A</b> Sept 18	<b>5.1 Drosophila as a model organism (Part 1)</b> <ul style="list-style-type: none"><li>• Genetic tools in flies</li></ul>	-	-
<b>Week 5B</b> Sept 20	<b>5.2 Drosophila as a model organism (Part 2)</b> <ul style="list-style-type: none"><li>• Key discoveries</li></ul>	-	-
<b>Week 6A</b> Sept 25	<b>6 C. elegans as a model organism</b>	-	Y
<b>Week 6B</b> Sept 27	1 <sup>st</sup> exam		
<b>Week 7A</b> Oct 2	<b>7.1 Molecular techniques on DNA/RNA (Part 1)</b> <ul style="list-style-type: none"><li>• DNA and RNA extraction methods</li><li>• PCR, real-time PCR, digital PCR</li><li>• LAMP</li><li>• Gene cloning</li></ul>	Group exercises	-
<b>Week 7B</b> Oct 4	<b>7.2 Molecular techniques on DNA/RNA (Part 2)</b>	-	Y

	<ul style="list-style-type: none"> <li>• RNAi</li> <li>• CRISPR</li> </ul>		
<b>Week 8A</b> Oct 9	<b>8. Highthroughput sequencing (Part 1)</b> <ul style="list-style-type: none"> <li>• Illumina and Nanopore methods</li> </ul>	Case study	
<b>Week 8B</b> Oct 11	<b>8.2 Highthroughput sequencing (Part 2)</b> <ul style="list-style-type: none"> <li>• Data analysis</li> </ul>	Group discussion	Y
<b>Week 9A</b> Oct 16	<b>9. Molecular techniques on proteins and metabolites</b>	Class exercise	Y
<b>Week 9B</b> Oct 18	<b>10. Single Cell Analysis</b>	Plan a proposal	-
<b>Week 10A</b> Oct 23	Class exercises and pre-exam Q&A		
<b>Week 10B</b> Oct 25	2 <sup>nd</sup> exam		
<b>Week 11A</b> Oct 30	<b>11.1 Critique molecular journal article 1</b>	Group discussion	-
<b>Week 11B</b> Nov 1	<b>11.2 Critique molecular journal article 2</b>	Group discussion	-
<b>Week 12A</b> Nov 6	<b>12.1 Omics data workshop Part 1</b>	Group workshop	-
<b>Week 12B</b> Nov 8	<b>12.2 Omics data workshop Part 2</b>	Group workshop	-
<b>Week 13A</b> Nov 13	<b>13. Guest lecture on data and AI</b>	-	Y
<b>Week 13B</b> Nov 15	<b>14. Molecular applications</b>	-	-
<b>Week 14</b>	<b>No class (enjoy thanksgiving week!)</b>		
<b>Week 15A</b> Nov 27	<b>15. Group debate</b>	Debate	
<b>Week 15B</b> Nov 29	<b>16. Career panel discussion</b>	Panel discussion	
<b>Week 16A</b> Dec 6	General feedback on the course; Pre-exam Q&A		
<b>Week 16B</b> Dec 8	3 <sup>rd</sup> exam		

## 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

	Point amount	% Grade
Exams (3 in total)	300 in total (100 each)	40%
Quizzes (7 in total)	68 in total	20%
Group Debate (1 in total)	75	15%

Active participation in class and Assignments	80	25%
<b>Total</b>	523	100%

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>.

### 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/UGRD/academic-regulations/attendance-policies/>.

### 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 feedback on the quality of instruction in this course using a standard set of university and college criteria. Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at:

<https://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 <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at: <https://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>).

### Recording and privacy

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

### 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.

0001 Reid Hall, 352-392-8565, <https://disability.ufl.edu/>

### Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general wellbeing are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

### Health and Wellness

**University Counseling & Wellness Center**, 3190 Radio Road, 352-392-1575

[www.counseling.ufl.edu](http://www.counseling.ufl.edu)

Counseling Services  
Groups and Workshops  
Outreach and Consultation  
Self-Help Library  
Wellness Coaching

**U Matter We Care**, [www.umatter.ufl.edu/](http://www.umatter.ufl.edu/)

**Career Connections Center**, First Floor JWRU, 392-1601, <https://career.ufl.edu/>

**Student Success Initiative**, <http://studentsuccess.ufl.edu>.

### Academic Resources

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to [Learning-support@ufl.edu](mailto: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.

**Writing Studio**, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers.

### Student Complaints

- Residential Course: <https://sccr.dso.ufl.edu/policies/student-honor-code-studentconduct-code/>.
- Online Course: <https://pfs.tnt.aa.ufl.edu/state-authorization-status/#student-complaint>