

ENY 4932
Honey Bee Biology
Fall 2020
3 credits

***This course is co-taught with ENY 6934 Honey Bee Biology.**

Lead-Instructor: Cameron Jack, MSc

Office Room #: ENY (Bldg 964), room 114

Office Address: Steinmetz Hall, Natural Area Drive, P.O. Box 110620, Gainesville, FL 32611

Office Phone #: 352-294-6926 (*Please email to set up a phone appointment.*)

E-mail: cjack@ufl.edu

Instructor: Jamie Ellis, PhD

Office Room #: ENY (Bldg 964), room 116

Office Address: Steinmetz Hall, Natural Area Drive, P.O. Box 110620, Gainesville, FL 32611

Office Phone #: 352-273-3924 (*Please email to set up a phone appointment.*)

E-mail: jdellis@ufl.edu

Website: www.ufhoneybee.com

TA: TBA

E-mail:

Special Note on Contact via Email: Due to UF privacy laws, you must use your GatorLink account or the Canvas mail system when emailing the Instructor or TA. Emails sent from other accounts (gmail, hotmail, etc.) will not be answered by the Instructor or TA.

Office Hours: By appointment.

Course Description: This course will provide an in-depth look into the fascinating world of honey bee biology. Herein, we will explore topics such as honey bee sociality, taxonomy, biogeography, behavior, anatomy, physiology, reproduction, nutrition and genetics. Additionally, these topics will be discussed via the paradigm of the honey bee superorganism.

Course Learning Objectives:

1. Compare the life-history strategies of different honey bee species and contrast the different traits of honey bee subspecies.
2. Describe the different tasks of honey bee workers and distinguish how these might change depending on conditions within the colony.
3. Identify the different structures of the honey bee anatomy and discuss how these function together as physiological systems.
4. Appraise the concept of the honey bee superorganism and argue whether or not honey bees fit this paradigm.
5. Interpret the findings from recent honey bee biology research publications and discuss the relevance they may have to beekeepers.

Required Readings:

1. Steinhauer, N. et al. 2018. Drivers of Colony Loss. *Current Opinion in Insect Science* 26: 142-148.
2. Holder P.J. et al., 2018. Fipronil pesticide as a suspect in historical mass mortalities of honey bees. *PNAS*, 115(51): 13033-13038.
3. Boncristiani, H. et al., 2019. Honey bee health world report. *Journal of Apicultural Research*, *In review*.
4. Leclercq, G. et al., 2018. Bioassays to quantify hygienic behavior in honey bee (*Apis mellifera* L.) colonies: a review. *Journal of Apicultural Research*, 663-673.

Textbook (Recommended): Caron, D.W. 2013 (revised from 1999). *Honey Bee Biology and Beekeeping*. Wicwas Press. Cheshire, CT, 368 pp.

Lectures: This is a fully online, Canvas-based course. The website for the syllabus, all lectures, reading materials, announcements, tests, etc. will be posted on eLearning: <http://lss.at.ufl.edu>. All lectures for this course are narrated presentations and will include videos and supplemental readings. We will provide text from all the narrated presentations, but you should pay close attention, as knowing and understanding the spoken information is critical for success in this course. All lectures and tests will be delivered online in Canvas.

Please note that all video clips and photographs are copyrighted and are NOT to be used outside of this class and may be used only this semester. Please do not copy or distribute these photographs or video clips. All class notes are provided for educational use only.

Course Notifications and Communication: All course communications (assignments, announcements, test information, etc.) will be made via the Announcements in Canvas. Please ensure that your Canvas profile is set to receive notifications (i.e. please check the appropriate box to receive all notifications). To do this, click on your name in the upper right corner of the Canvas homepage after logging into Canvas. Next, click “notifications” on the left. This will take you to the Notification Preferences page. Then, click the check symbol for at least the following notifications: Due Date, Course Content, Announcement, and Grading.

Students are encouraged to post general questions on topics taught in the class under the General Questions thread. The instructor and/or the TAs will respond to the questions. Other students are also encouraged to respond to the questions. Private questions should be sent to the TAs via e-mail.

Everyone is busy, so please do not expect immediate responses to emails or discussion posts. The instructor and TAs will do our best to respond within 24 hours during the week and 48 hours on weekends. We will also do our best to grade assignments within one week of the due date.

Course Schedule: This course is offered via Canvas as a distance education course. To stay on track, students must adhere to the course schedule.

Module	Video Content	Weekly Readings	Module Assessments	Critical Thinking Exercises	Research Blog Post Assignments
Getting Started	Welcome video	Course syllabus; Tips for success	Sep.4 th		
Insects	Insecta, Hymenoptera, Differentiating bees and wasps, common bee groups, common wasp groups, bee/wasp mimics		Sep.4 th		
Sociality	What makes insects social?, Levels of sociality, Evolution of sociality		Sep.4 th		
Honey Bee Taxonomy	Apidae, Apis, Honey bee taxonomy (Micrapis, Megapis and Apis)		Sep. 11 th	Sep. 11 th	Select Blog Post Topic Sep. 11 th
Biogeography and Taxonomy of genus Apis	florea, andreniformis, dorsata, laboriosa, nigrocinta, cerana, koshvenokvi, nuluensis, mellifera		Sep. 18 th		
Biogeography and Taxonomy of Apis mellifera	Overview of lineages, Lineage A, Lineage M, Lineage, C, Lineage O, Minor lineages		Sep. 25 th	Sep.25 th	
The Colony and the Nest	Adult members of a honey bee colony, Immature members of honey bee colonies, Components of a nest		Oct. 2 nd		
Honey Bee and Colony Behaviors	Tasks of a worker, Honey bee dance language, Thermoregulation, Swarm preparation, The swarm, Choosing a nest site, Queen and drone behaviors		Oct. 9 th	Oct. 9 th	
External Anatomy and Physiology	Head, Thorax, Abdomen		Oct. 16 th		1 st Submission Oct. 16 th
Internal Anatomy and Physiology	Digestive system, Nervous system, Circulatory system, Respiratory system, Reproductive system, Muscular system, Endocrine system, Immune system, Exocrine system		Oct. 23 rd		Peer Review Oct. 23 rd

Honey Bee Genetics	Introduction, Haplo-diploidy, Arrentoky, Theylotoky		Oct. 30 th		
Honey Bee Nutrition	Larval diet, adult diet, Nectar and honey, Pollen, Foraging habitats		Nov. 6 th	Nov. 6 th	
Pest Pathogen Overview	Major arthropod pests, Minor arthropod pests, Pathogen stressors, Other stressors, Principle stressors, Overcoming bee defenses		Nov. 13 th		
Mating	Sexual maturation of the queen, Sexual maturation of the drones, Drone congregation areas, Honey bee mating, Post-mating maturation		Nov. 20 th		Final Submission Nov. 20 th
Superorganism	Overview, Food collection, Endocrine and exocrine systems, Respiration and thermoregulation, Immune system, Communication, Summary		Dec. 4 th	Dec. 4 th	

Evaluation: The course grade is based on total points earned out of 500 possible points.

Module assessments	15 points each × 14 assessments	210 points
Section critical thinking exercises	35 points each × 5 exercises	175 points
Select Topic for Blog Post	5 points	5 points
Submission of your peer evaluations of two of your peers' Extension Blog Post	15 points × 2 peer reviews	30 points
Final draft of your Extension Blog Post	80 points	80 points
	Total Course Points	500 points

Grades and Grade Points

For information on current UF policies for assigning grade points, see catalog.ufl.edu/UGRD/academic-regulations/grades-gradingpolicies/.

FINAL GRADING		
% grade	Letter grade	Points needed to achieve letter grade
100-93	A	≥ 465
90-92	A-	450 – 464
87-89	B+	435 – 449
83-86	B	415 – 434
80-82	B-	400 – 414
77-79	C+	385 – 399
73-76	C	365 – 384
70-72	C-	350 – 364
67-69	D+	335 – 349
63-66	D	315 – 334
60-62	D-	300 – 314
0-59	E	0 – 299

Assignments:

(1) Module Assessments: There is a 15-point assessment associated with each of the fourteen modules in this course. These assessments are *open note* (i.e. you are allowed to use class lectures, books, websites, etc. while taking the assessments). The assessments will be composed of true/false and multiple choice questions. **The assessments 1) open the Saturday morning after the previous section ends, 2) are timed (30 minutes each), and 3) are due on the following Friday at 11:59 pm on the date listed in the course schedule.** These are individual assessments so please do your own work and do not work in groups or share your answers. There is a large bank of test questions for each assessment and the assessment questions are selected randomly for each student. You will receive a 5-point deduction for each day a module assessment is late.

The first module assessment is a graded syllabus quiz on the “Getting Started” module. You need to read the syllabus and answer quiz questions related to it by **11:59 pm ET on the date listed in the course schedule.** You must complete the syllabus quiz before you are able to advance to the next module. This quiz will show you how your online assessments will be formatted as well as allow you to demonstrate that you understand how this course works and important due dates.

(2) Critical Thinking Exercises: These exercises are designed to encourage you to think critically about the content presented in the module lectures. The critical thinking exercises are worth 35 points each. These are

individual exercises so please do your own work and do not work in groups or share your answers. All of the critical thinking exercises are open note and untimed. You can close and reopen the exercise as many times as you would like until the due date (see course schedule), but you will not be able to make any changes once you have officially submitted your final exercise. **The exercises are due at 11:59 pm on the date listed in the course schedule.** You will receive a 5 deduction for each day a module assessment is late.

(3) Research Blog Post: One of the most useful skills in any profession is writing. Furthermore, one of the missions of the Land Grant Institution is extension, which means we are communicating with the general public. As such, you are required to produce a blog post which explains the findings from a recent peer-reviewed honey bee research article. This should be based on a paper that was published in the last three years and would be of interest to beekeepers, meaning it should be relevant to honey bee health, production, treatment, etc. Your blog post should be written to have the potential for publication through the University of Florida's extension branch (Cooperative Extension Service). You **must** check with the TA before beginning your blog post so that they can verify that such a blog post does not already exist on your research paper. The instructor or TA can provide ideas for selecting a research paper, but the papers will be reserved on a first come first serve basis. **A grading rubric will be provided in Canvas to facilitate the development of your blog post.**

Here is an example of a blog post written about a widely-discussed research article <http://blogs.ifas.ufl.edu/entnemdept/2018/04/18/lithium-chloride-for-varroa-control/> based on the paper by Ziegelmann et al., 2018 Scientific Reports 8:683 <https://www.nature.com/articles/s41598-017-19137-5.pdf>. You'll notice how the author created figures helpful to understanding the research as well as linking to other useful videos and information.

Your Research Blog Post should convey scientific information in a way that a high school student could understand. Figures are extremely helpful in extension documents, and students are encouraged to include as many figures as necessary to explain a topic. You must obtain use permission from the owner of any figures you include in your final report if the figure is not original to you. There will be an additional assignment to submit with the Final Extension Report called "Extension Report Figures and Permissions." For this assignment, you will upload the full-sized jpeg file for each figure and fill in the accompanying word document with the proof of permission for use.

There are four components of the Research Blog Post that compose the completed assignment. Due dates for each component are listed in the course schedule.

- 1) Select Research Article Due – The student should identify and record the research article chosen for the Research Blog Post by completing the Canvas assignment "Select Research Article".
- 2) 1st Submission – This is not a rough draft, but rather is what the student considers the completed document.
- 3) Peer Review – The 1st submission will be shared with other students in the class who will provide a peer review of the report by the due date listed in the course schedule. Each student will peer review two Research Blog Posts. Your review should include constructive, respectful comments and suggestions via track changes in a Word document. You will be awarded points based on the quality of your reviews. Thoughtful reviews will receive a maximum of 15 points per review.
- 4) Final Submission – Students are expected to revise their Research Blog Posts per the "good" comments provided during the peer review process. The final report must be submitted by the due date shown in the course schedule.

A grading rubric will be provided in Canvas to facilitate development and peer review of the Research Blog Post. **Five points will be deducted from the final project score every day past the due dates that any of the information requested above is late.** Please do not wait until the last minute to produce your blog post or meet any of the other deadlines. All points lost will be deducted from the final Research Blog Post grade.

Absences and Make-Up Work: Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at: catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Online Course Evaluation Process: 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 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 Honesty: UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students 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.” The Honor Code (sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Services for Students with Disabilities: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Campus Resources:

Health and Wellness

U Matter, We Care: If you or someone you know is in distress, please contact <mailto:umatter@ufl.edu>, 352-392-1575, or visit umatter.ufl.edu to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit counseling.ufl.edu or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit shcc.ufl.edu.

University Police Department: Visit police.ufl.edu or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; ufhealth.org/emergency-room-trauma-center.

Academic Resources

E-learning technical support: Contact the [UF Computing Help Desk](#) at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services career.ufl.edu/.

Library Support: cms.uflib.ufl.edu/ask various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring. teachingcenter.ufl.edu/

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers. writing.ufl.edu/writing-studio/

Student Complaints On-Campus: sccr.dso.ufl.edu/policies/student-honor-codestudent-conduct-code/

On-Line Students Complaints: distance.ufl.edu/student-complaint-process/