BIO 331 Parasitology - Summer 2025 – session one

Instructor: Dr. Niels Hobbs – nvshobbs@uri.edu
TA grader: Jacob Green - gree9242@uri.edu
Lectures and labs: asynchronous; Office Hours: *anytime* by appt. via Zoom

COURSE DESCRIPTION - a survey course on the biology of parasitic organisms, with an emphasis on animal parasites. With roughly half of all known species being parasitic, these organisms dramatically shape the biological world. This course provides an overview of the most important groups of eukaryotic parasites, their life cycles, infection pathways, and their physiological and ecological impacts on hosts. Major themes in the field will be explored via lecture, laboratory exercises, literature review, and discussion groups. The lab component will focus on the large collection of parasitology slides and specimens the Biological Sciences Department currently owns, as well as locally collected live specimens.
PREREQUISITES - This course is a three-credit course: two lecture, one lab. Prerequisites: Bio 101-102, but junior or senior standing is recommended, as this will be a challenging course for those with only the basics – challenging but doable.

COURSE LEARNING OUTCOMES - Over the course of this summer session you will learn to:
1. Classify and correlate the core taxonomic groups covered in the course, generally to Phylum or Class – in some cases, individual important species should be known.
2. Characterize and distinguish important morphological characteristics of parasites to taxon and life history phase.
3. Understand and summarize the life history of key example parasites, including the following:
 - vectors and hosts and means of infection for each host and their means of invasion.
 - developmental pathways in each host, including migration and multiplication.
4. Develop a broad knowledge of the impact that parasites have on the biological world and the ecology of living organisms – including both non-animal parasites and non-animal hosts.
5. Summarize how parasitism has evolved across the biological world and describe the various forms of parasitism beyond the standard host-parasite symbiosis.
6. Research and synthesize representative species and their distinguishing physiological and ecological features, and be able to compile a thorough survey of parasite diversity.
6. Summarize, defend, and critique the findings of relevant scientific literature.

READINGS - You will have a few weekly readings from recent primary literature corresponding with the taxa being covered and focusing on different aspects of parasitology. These readings will selected by YOU and an assigned partner and will be posted to the brightspace course site. With my help, you and your partner will be responsible for choosing a paper for the week's content and then create a presentation to share with the class *There is no textbook*. Most of science happens in the primary literature, so this is where I'd like us to explore this very active and diverse subject.

METHOD OF EVALUATION

Grade Break Down
Exam One – 20%
Exam Two – 20%
Paper presentation – 10%
Discussion participation – 10%
Laboratory Grade – 40%
- Practical – 15%
- Parasite presentation – 15%
- Lab Portfolio – 10%

Grade Scale
A: 93-100, A-: 90-92.9
B+: 87-89.9, B: 83-86.9,
B-: 80-82.9
C+: 77-79.9, C: 73-76.9,
C-: 70-72.9
D: 60-69.9

LECTURE – this component will involve pre-recorded lectures and lecture slides from past semesters and some additional content I'll share with you. It will be primarily graded based on two exams comprised of short answer and short essay questions. Given the narrow time frame of this course, exams cannot be taken at another time without a valid university-approved medical excuse. Additionally, students in pairs will be assigned specific papers to lead class discussion – these will be presented remotely via recorded video presentations.

LABORATORY – While entirely remote and asynchronous, participation and engagement directly correlate with your grade. The lab grade is based on a short practical exam, a 10-minute pre-recorded presentation on a specific parasite, and a lab portfolio of representative species from major parasitic groups.

MAJOR STUDY UNITS

Week One:
- Introduction to symbiosis and parasitism
- Survey of protozoan parasites

Week Two:
- Survey of platyhelminth parasites

Week Three:
- Survey of nematode and acanthocephalan parasites

Week Four:
- Survey of arthropod parasites
- Introduction to parasites outside of the animal kingdom (fungi, algae, plants, etc)

Week Five:
- Variant parasitism in behavior and ecology (brood parasitism, kleptoparasitism, etc)

TECHNOLOGY REQUIREMENTS

To successfully complete this course, you will need access to a computer with reliable, high-speed Internet access and appropriate system and software to support the Brightspace learning platform. Typical technical requirements for users are:

Windows 7 (XP or Vista) 64 MB Ram 28.8 kbps modem (56k or higher recommended) SoundCard & Speakers External headphones with built-in microphone Mozilla Firefox 9.0 or higher	Mac OS X or higher 32 MB Ram 28.8 kbps modem (56k or higher recommended) SoundCard & Speakers External headphones with built-in microphone Mozilla Firefox 9.0 or higher; Safari 5.0 or higher

Also requires Word 2007 (PC) 2011 (MAC) or newer, PowerPoint, Excel, Adobe Flash, and Adobe Acrobat Reader.

BRIGHTSPACE HELP

Here is the link to access Brightspace https://brightspace.uri.edu as well as the Brightspace resource page https://web.uri.edu/brightspace/.

ATTENDANCE AND OTHER CLASS POLICIES

Students are expected to attend class and classroom activities. Occasionally, students may miss class activities due to illness, severe weather, or sanctioned University events. If ill, students should not attend class and should seek medical attention especially if they have a communicable disease such as influenza (flu). Students should not attend class when the University announces classes are cancelled due to severe weather. Also, it is the policy of the University of Rhode Island to accord students, on an individual basis, the opportunity to observe their traditional religious holidays. Students desiring to observe a holiday of special importance must inform each instructor and discuss options for missed classes or examinations. See the University Manual for policy regarding make-up of missed class or examinations.

While this course is mostly in-person, some components will be completed via Brightspace. Please refer to the Brightspace YouTube video tutorials before you get started and refer back to them as a resource as needed while you complete this course.

NETIQUETTE FOR ONLINE COURSE

- Be polite and respectful of one another.
- Avoid personal attacks. Keep dialogue friendly and supportive, even when you disagree or wish to present a controversial idea or response.
- Be careful with the use of humor and sarcasm. Emotion is difficult to sense through text.
- Be helpful and share your expertise. Foster community communication and collaboration.
- Contribute constructively and completely to each discussion. Avoid short repetitive "I agree" responses and don't make everyone else do the work.
- Consider carefully what you write. Re-read e-mails and discussion before sending or posting.
- Remember that e-mail is considered a permanent record that may be forwarded to others.
- Be brief and succinct. Don't use up other people's time or bandwidth.
- Use descriptive subject headings for each e-mail message.
- Respect privacy. Don't forward a personal message without permission.
- Cite references. Include web addresses, authors, names of articles, date of publication, etc.
- Keep responses professional and educational. Do not advertise or send chain letters.
- Do not send large attachments unless you have been requested to do so or have permission from all parties.
- Two-word postings (e.g.: I agree, Oh yeah, No way, Me too) do not "count" as postings.

URI ACADEMIC WRITING STANDARDS

Specific writing standards differ from discipline to discipline and learning to write persuasively in any genre is a complex process, both individual and social, that takes place over time with continued practice and guidance. Nonetheless, URI has identified some common assumptions and practices that apply to most academic writing done at the university level. These generally understood elements are articulated here to help students see how they can best express their ideas effectively, regardless of their discipline or any particular writing assignment.

Venues for writing include the widespread use of e-mail, electronic chat spaces and interactive blackboards. URI is committed to guaranteeing that students can expect all electronic communication to meet Federal and State regulations concerning harassment or other "hate" speech. Individual integrity and social decency require common courtesies and a mutual understanding that writing--in all its educational configurations--is an attempt to share information, knowledge, opinions and insights in fruitful ways.

Academic writing (as commonly understood in the university) always aims at correct Standard English grammar, punctuation, and spelling. The following details are meant to give students accurate, useful, and practical assistance for writing across the curriculum of URI.

Students can assume that successful collegiate writing will generally:

- Delineate the relationships among writer, purpose and audience by means of a clear focus (thesis statements, hypotheses or instructor-posed questions are examples of such focusing methods, but are by no means the only ones) and a topic that's managed and developed appropriately for the specific task.
- Display a familiarity with and understanding of the particular discourse styles of the discipline and/or particular assignment.
- Demonstrate the analytical skills of the writer rather than just repeating what others have said by summarizing or paraphrasing
- Substantiate abstractions, judgments, and assertions with evidence specifically applicable for the occasion whether illustrations, quotations, or relevant data.
- Draw upon contextualized research whenever necessary, properly acknowledging the explicit work or intellectual property of others.
- Require more than one carefully proofread and documented draft, typed or computer printed unless otherwise specified.

The Writing Center, located in Roosevelt Hall 009, offers one-on-one peer tutoring for student writers who need help developing ideas or need advice on any aspect of writing. The Writing Center serves all student writers, not just "beginners." Visiting writers are encouraged to bring a draft, notes, syllabus, or any relevant information to help facilitate the session. Students may view the schedule and make appointments. Sessions are 45 minutes per appointment and students are encouraged to make appointments in advance by logging onto uri.mywconline.com. For more tips on how to make the best of your Writing Center appointment, visit uri.edu/aec/writing.

PROFESSIONAL CONDUCT

Cheating and plagiarism are serious academic offenses, which are deal with firmly by the College and University. Scholastic integrity presumes that students are honest in all academic work. **Cheating** is the failure to give credit for work not done independently (i.e., submitting a paper or any work written by someone other than yourself), unauthorized communication during an examination, or the claiming of credit for work not done (i.e., falsifying information). **Plagiarism** is the failure to give credit for another person's written or oral statement, thereby falsely presuming that such work is originally and solely your own. *Use of A.I. to generate ANY course content is every bit as much cheating and will be treated as such. Use of A.I. to generate ANY course content is every bit as much cheating and will be treated as such.*

If you have any doubt about what constitutes plagiarism, visit the following website: https://honorcouncil.georgetown.edu/whatisplagiarism, the URI Student Handbook and Manual sections on plagiarism and cheating at http://web.uri.edu/studentconduct/student-handbook/.

Students are expected to be honest in all academic work. A student's name on any written work, quiz or exam shall be regarded as assurance that the work is the result of the student's own independent thought and study. Work should be stated in the student's own words, properly attributed to its source. Students have an obligation to know how to quote, paraphrase,

summarize, cite and reference the work of others with integrity. The following are examples of academic dishonesty:

- Using material, directly or paraphrasing, from published sources (print or electronic) without appropriate citation;
- Claiming disproportionate credit for work not done independently;
- Unauthorized possession or access to exams;
- Unauthorized communication during exams;
- Unauthorized use of another's work or preparing work for another student;
- Taking an exam for another student;
- Altering or attempting to alter grades;
- The use of notes or electronic devices to gain an unauthorized advantage during exams;
- Fabricating or falsifying facts, data or references;
- Facilitating or aiding another's academic dishonesty;
- Submitting the same paper for more than one course without prior approval from the Instructor.

Please note the following section from the University Manual:

> **8.27.17.** Instructors shall have the explicit duty to take action in known cases of cheating or plagiarism. The instructor shall have the right to fail a student on the assignment on which the instructor has determined that a student has cheated or plagiarized. The circumstances of this failure shall be reported to the student's academic dean, the instructor's dean, and the Office of Student Life. The student may appeal the matter to the instructor's dean, and the decision by the dean shall be expeditious and final.
>
> Such action will be initiated by the instructor if it is determined that any written assignment is copied or falsified or inappropriately referenced.

Any good writer's handbook as well as reputable online resources will offer help on matters of plagiarism and instruct you on how to acknowledge source material. If you need more help understanding when to cite something or how to indicate your references, PLEASE ASK.

Please note: Students are responsible for being familiar with and adhering to the published **"Community Standards of Behavior: University Policies and Regulations"** which can be accessed in the **University Student Handbook.**

ACADEMIC SUPPORT SERVICES

Office of Disability Services
Americans With Disabilities Act Statement: Any personal learning accommodations that may be needed by a student covered by the "Americans with Disabilities Act" must be made known to the university as soon as possible. This is the student's responsibility. Information about services, academic modifications and documentation requirements can be obtained from the The Office of Affirmative Action, Equal Opportunity and Diversity (AAEOD).
https://web.uri.edu/affirmativeaction/

Any student with a documented disability is welcome to contact me early in the semester so that we may work out reasonable accommodations to support your success in this course. Students

should also contact Disability Services for Students, Office of Student Life, 330 Memorial Union, 401-874-2098.

From the University Manual: 6.40.10 and 6.40.11 Accommodations for Qualified Students With Disabilities: Students are expected to notify faculty at the onset of the semester if any special considerations are required in the classroom. If any special considerations are required for examinations, it is expected the student will notify the faculty a week before the examination with the appropriate paperwork.

URI Online Library Resources

https://web.uri.edu/library/

URI Email: I will send regular emails with updates related to the course. It is your responsibility to check your URI email for these messages.

Standards of behavior: Students are expected to treat faculty and fellow classmates with dignity and respect. Students are responsible for being familiar with and adhering to the published "Student Code of Conduct" which can be found in the University Student Handbook. If you must come in late, please do not disrupt the class. Please turn off all cell phones, pagers, or any electronic devices.

Your involvement: I very much enjoy a lively discussion and encourage you all to ask questions during class. If you're particularly interested in certain taxa or concepts, please speak up. Remember, if you're unclear on something, chances are others in the class may also benefit by your speaking up. Don't be shy! You will have to work to master this material and asking questions is a necessary part of that work.

ASSIGNED READINGS

Baker, D.M., Freeman, C.J., Wong, J.C.Y., Fogel, M.L. and Knowlton, N. 2018. Climate change promotes parasitism in a coral symbiosis. *The ISME Journal*,**12**, pp. 921–930.

Bergman, M.P., Reyda, F.B. and Heilveil, J.S., 2015. Host Use of *Leptorhynchoides thecatus* (Acanthocephala) from the Upper Susquehanna River Basin, New York, USA. *Comparative Parasitology*, *82*(1), pp.109-114.

Davis, E.L., R.S. Hussey, T.J. Baum, 2004. Getting to the roots of parasitism by nematodes. *Trends in Parasitology*, 20(3): 134-141.

Diosdado, A., Simón, F., Morchón, R., and González-Miguel, J. 2020. *Dirofilaria immitis* possesses molecules with anticoagulant properties in its excretory/secretory antigens. *Parasitology*, *147*(5), 559-565.

de Bekker, C., Quevillon, L.E., Smith, P.B., Fleming, K.R., Ghosh, D., Patterson, A.D. and Hughes, D.P., 2014. Species-specific ant brain manipulation by a specialized fungal parasite. *BMC Evolutionary Biology*, *14*(1), p.166.

Freese, J.M. and Lane, C.E., 2017. Parasitism finds many solutions to the same problems in red algae. *Molecular and biochemical parasitology*, *214*, pp.105-111.

Hajek, A.E., Hurley, B.P., Kenis, M., Garnas, J.R., Bush, S.J., Wingfield, M.J., Van Lenteren, J.C. and Cock, M.J., 2016. Exotic biological control agents: A solution or contribution to arthropod invasions? *Biological invasions*, *18*(4), pp.953-969.

Klutsch, J.G., Najar, A., Sherwood, P., Bonello, P. and Erbilgin, N., 2017. A native parasitic plant systemically induces resistance in jack pine to a fungal symbiont of invasive mountain pine beetle. *Journal of chemical ecology*, *43*(5), pp.506-518.

Lukeš, J., Skalický, T., Týč, J., Votýpka, J. and Yurchenko, V., 2014. Evolution of parasitism in kinetoplastid flagellates. *Molecular and biochemical parasitology*, *195*(2), pp.115-122.

Medina, I. and Langmore, N.E., 2016. Batten down the thatches: front-line defences in an apparently defenceless cuckoo host. *Animal behaviour*, *112*, pp.195-201.

O'Dwyer, K., Kamiya, T. and Poulin, R., 2014. Altered microhabitat use and movement of littorinid gastropods: the effects of parasites. *Marine biology*, *161*(2), pp.437-445.

Weber, JN, Kalbe, M, Shim, KC, Erin NI, Steinel NC, Ma, L, and Bolnick, DI. 2017. Resist globally, infect locally: a transcontinental test of adaptation by stickleback and their tapeworm parasite. The American Naturalist; 189 (1): 43-57.

Whittington, I.D. and G.C. Kearn, 2011. Hatching strategies in monogenean (platyhelminth) parasites that facilitate host infection. *Integrative and Comparative Biology*, 51(1): 91-99.

COURSE SCHEDULE with Course Learning Outcomes (CLOs)

	Week 1 19 – 24 May	**Week 2** 26 - 31 May	**Week 3** 2 - 7 June	**Week 4** 9 - 14 June	**Week 5** 16 - 21 June
CLOs Addressed	Students will be able to incorporate basic parasite terminology in discussions and comprehend core characteristics of parasitic symbioses; be able to describe characteristics of protozoan parasites: anatomy, life cycle, ecology	Students will be able to describe key characteristics of platyhelminth parasites: basic anatomy, life cycle, and ecology	Students will be able to describe key characteristics of nematode and acanthocephalan parasites: basic anatomy, life cycle, and ecology	Students will be able to describe key characteristics of arthropod parasites and some select examples of non-animal parasites and parasitic relationships	Students will be able to describe and discuss the impact of parasitism on behavior and ecology, and describe some behavioral parasitisms
Topics	Introduction, Terminology, parasitism as strategy; Survey of protozoan parasites	Survey of platyhelminth parasites *May 26th* ***Memorial Day*** *(cook your hamburgers very well!)*	Survey of Nematode parasites; Acanthocephalan parasites	Survey of Arthropod parasites; Non-animal parasites – algae, plants, fungi, bacteria, viruses, etc. *June 19 -* ***Juneteenth***	Variants: Kleptoparasitism and brood parasitism; Behavior and Ecology of Parasites, parasites as regulatory mechanisms, Red Queen
Assignments	Lecture: - introduction - protozoa Lab portfolio (due by Friday at 6pm) Reading summary (participate in discussion by Thursday, 6pm)	Lecture: - platyhelminths Lab portfolio (due by Friday at 6pm) Reading summary (by Wednesday, 6pm)	Lecture: - nematodes - acanthocephala Lab portfolio (due by Friday at 6pm) Reading summary (due by Thursday, 6pm)	Lecture: - arthropods - non-animal parasites Lab portfolio (due Thursday at 6pm) Reading summary (due Thursday 6pm) Parasite species Presentations (Thursday evening)	Lecture: - behavior and ecology of parasitism Reading summary (due Thursday, 6pm)

Discussions	Introductions! What we think of parasites – *Parasite Rex* reading discussion (due Wed., 6pm)	Platyhelminths Discussion of reading summary (due by Friday, 6pm)	Nematodes Acanthocephala Discussion of reading summary (due by Thursday, 6pm)	Arthropods Non-animal parasites Discussion of reading summary and species presentations (by Thurs, 6pm)	Parasitism in behavior and ecology Discussion of reading summary (due Thurs, 6pm)
Exams			Exam One (Tuesday)	Lab practical (Thursday)	Exam Two (Friday)
Multimedia	RadioLab podcast on parasites (listen by Monday, 6pm);	Lab video on platyhelminths (watch by ~Monday, 6pm)	Lab videos on nematodes and acanthocephalan (watch by Monday, 6pm)	Lab videos on arthropods (watch by Monday, 6pm); Guest lecture video on red algal parasites (watch by Friday, 6pm)	Video on brood parasitism (watch by Monday, 6pm); Byers and Red Queen videos (watch by Wednesday, 6pm)
Readings	*Parasite Rex* intro excerpt; Lukes et al 2014	Weber et al, 2017; Wittington & Kearn, 2011	Davis et al, 2004; Bergman et al, 2015; Diosdado et al, 2020	Baker et al, 2018; Hajek et al, 2016; Freese & Lane, 2017; Klutsch et al, 2017	Medina & Langmore, 2015; de Bekker et al, 2014, O'Dwyer et al. 2014

NOTE: Final course grades are DUE to URI Sunday night, so ALL work must be completed by 6pm on Sunday, June 22.