

EEB 310
Evolution, Disease, and Medicine
Spring Term 2023
University of Tennessee, Knoxville

Course Section: Evolution, Disease & Medicine - EEB 310 - 001
Meeting Place and Time: Hesler-427 Tuesday and Thursday 11:20AM - 12:35PM
Course Credit Hours: 3

Faculty Contact Information

Phone: 352-226-3812 (not a great way to reach me)
Email: jjiao3@utk.edu (don't email me for fast turn-around; email our TA: M Belal Hossain)
Instructor Web Page: <http://feffermanlab.org/jing.html>
Office: 424 Hesler Biology Building
Office Hours: Tues, 2-3pm or by appointment with either Jiao or Belal



TA Contact Information (the person to ask course questions)

M Belal Hossain
Email: belal.vetmed@gmail.com

Course Description/Information:

This course introduces the theory of evolution and its real-world applications to the practice of medicine. Concepts of survival and reproduction defining evolutionary fitness, co-evolution, competition, natural selection, bottleneck effects, adaptation and exaptation will be introduced and applied in the context of discussion of human and animal disease and the medical treatment thereof. The course will cover infectious and non-infectious diseases. We will also extend these concepts past individual-level medicine to population-level public health and consider real-world cases such as antibiotic resistance, vaccination leading to strain replacement, and disease control decisions such as targeting specific populations for vaccination.

Value Proposition:

Students should come out of this course with an increased understanding of the evolutionary underpinnings of disease and the effect those underpinnings have on medical strategies for intervention. Moreover, students should gain experience in forming logical and rigorous scientific arguments, applying theory to generate hypotheses consistent with observations, and applying and interpreting theory to predict the outcomes of experimental manipulations/interventions.

Student Learning Outcomes/Objectives:

- Students will be able to define and discuss concepts of evolutionary fitness as survival and reproduction, heritability with variation as the mechanism for adaptation, natural and sexual selection as a mechanism of speciation, and non-selection-based mechanisms of evolution.
- Students will be able to analyze disease and disease-related healthcare concepts from human medicine as evolutionary pressures.
- Students will be able to evaluate medical treatment strategies within the context of evolved responses and altered selective pressures.
- Students will be able to apply logic and formal argument to determine and explain whether or not particular conclusions are adequately supported by presented facts.

Learning Environment:

This class will rely mostly on discussions (both in class and online). Lecture slides will be presented as a starting point, but the goal is to spark questions and discussion of topics. If you aren't comfortable participating in in-class discussions, please be sure to participate actively in the weekly online conversations.

Course Communications:

Please email the course TA (M Belal Hossain; belal.vetmed@gmail.com) with any questions you have. He will try to respond to emails within 24 hours M-F, and by the end of day Monday if sent over a weekend.

I will communicate with you via the Course Canvas site and by individual email (when appropriate). Please actively check the Canvas site regularly.

How to Be Successful in This Course:**Student's Responsibility**

- Be prepared for all classes
- Be respectful of others
- Actively contribute to the learning activities in and outside of class – especially asking or answering questions
- Abide by the UT Honor Code
- If you do badly on an assessment, revisit the topic and figure out what you missed and why

Instructor's Responsibility

- Be prepared for all classes
- Evaluate all fairly and equally to the best of my abilities
- Be respectful of all students
- Create and facilitate meaningful learning activities
- Behave according to University codes of conduct

Texts/Resources/Materials:

Suggested: Why We Get Sick by Nesse and Williams

Required: Course Canvas Site

Required Equipment:

Regular Internet Access

Course Requirements, Assessments, and Evaluations:

Attendance Policy: Attendance is expected (though not a part of your grade) and active participation in course discussions is required (this can be online if you aren't comfortable participating actively in class). I will not be willing to use email/office hours to go over everything we covered in class just because you weren't there. Please try to come or find a classmate to share notes with you.

Grading System:

5 short quizzes (out of 6 quizzes - lowest grade dropped; 10% each)

Midterm exam (15%)

Weekly assignment (online; described below) (15%)

Final project (20%)

Grade Weighting: The course will not have weighted grades unless we get to the second-to-last week of the semester and more than half of you have earned less than a 70%, in which case, clearly our communication methods have been failing and we will discuss together in class what to do about it/how to rescale appropriately.

Anticipated Grade Scales:

A : 93-100

A- : 90-92

B+ : 85-89

B : 80-84

B- : 77-79

C+ : 74-76

C : 70-73

C- : 65-69

D+ : 62-64

D : 59-61

D- : 55-58

F : 0-54

Assignments and Exams

- There will be 6 quizzes throughout the course (see Course Outline below for dates).
 - i. Quizzes will be released via the Canvas site on the dates given, with in-class time to ask questions, but they will not be due until two days later – you can work on them for however long you like until then.
 - ii. Quizzes are open note, open discussion with peers, open internet search, open everything. **HOWEVER, you must write your answers independently and in your own words.**

- iii. Each quiz will have available “retake” versions. If you don’t like the grade you get on the first version, you can take a make-up/retake version and if you do better, I will replace that grade with the better grade on that quiz.
 - iv. Only your top 5 quizzes will count towards your quiz grade (i.e. I will drop one quiz). *NOTE: retake versions help you bring up that same quiz grade, I won’t keep both the original and a retake quiz grade on the same topic in your top 5 scores.*
- There will be an in-class Midterm Exam (it will be like the quizzes). See Course Outline below for the date. It will be given during 1 class period, but if you want, you can continue working on it for 2 more days.
 - Weekly homework assignment:
 - i. Each week, you must find a news story or scientific article and post it to the online discussion (on the Canvas site) for the class with an accompanying (brief) logical analysis of the topic covered, pointing out logical or scientific flaws (if any) and/or extending the conclusions to relate to a concept discussed that week in class.
 - ii. You must also read and comment (briefly) on the contributions of at least two other students.
 - iii. We will discuss some of these in class.
 This assignment will be assessed on a 2 point scale: 1 point for completing the required 3 posts, 1 point for logic of the analysis provided in their own contribution.

Course Feedback:

Feedback will be given mostly via assessment of performance on quizzes and in discussion in class and online.

University Policies:

Academic Integrity:

“An essential feature of the University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity.”

University Civility Statement:

Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, graciousness, cordiality, affability, amiability and courteousness. Civility enhances academic freedom and integrity, and is a prerequisite to the free exchange of ideas and knowledge in the learning community. Our community consists of students, faculty, staff, alumni, and campus visitors. Community members affect each other’s well-being and have a shared interest in creating and sustaining an environment where all community members and their points of view are valued and respected. Affirming the value of each member of the university community, the campus asks that all its members adhere to the principles of civility and community adopted by the campus: <http://civility.utk.edu/>.

Disability Services:

“Any student who feels he or she may need an accommodation based on the impact of a disability should contact the Office of Disability Services (ODS) at 865-974-6087 in 100 Dunford Hall to document their eligibility for services. ODS will work with students and faculty to coordinate reasonable accommodations for students with documented disabilities.”

Your Role in Improving Teaching and Learning Through Course Assessment:

At UT, it is our collective responsibility to improve the state of teaching and learning. During the semester, you may be requested to assess aspects of this course either during class or at the completion of the class. You are encouraged to respond to these various forms of assessment as a means of continuing to improve the quality of the UT learning experience.

Key Campus Resources for Students:

- [Undergraduate Catalog](#): (Listing of academic programs, courses, and policies)
- [Graduate Catalog](#)
- [Hilltopics](#): (Campus and academic policies, procedures and standards of conduct)
- [Course Timetable](#): (Schedule of classes)
- [Academic Planning](#): (Advising resources, course requirements, and major guides)
- [Student Success Center](#): (Academic support resources)
- [Library](#): (Access to library resources, databases, course reserves, and services)
- [Career Services](#): (Career counseling and resources; HIRE-A-VOL job search system)
- [Student Health Center](#) (visit the site for a list of services)
- OIT Help Desk: (865) 974-9900

Course Outline and Schedule:

These are rough estimates – I expect some topics will take longer, others will be shorter. We may zoom ahead or slow down, as interest and discussion dictate throughout the semester.

Jan 24th – Initial Survey (ungraded)

Course Introduction, Go over Syllabus Together, Reviewing Expectations, Mechanisms of evolution (genes, DNA, basics), Introduction to evolutionary fitness &

Feb 7th – Quiz #1 released on Canvas site

Reading: Nesse & Williams, Why We Get Sick, Chapters 1 & 2

Topics: Definitions and causes of disease & How to do quizzes in this class

Feb 16rd – Reading: Gould and Lewontin. "The spandrels of San Marco and the Panglossian paradigm: a critique of the adaptationist programme." Proceedings of the Royal Society of London. B. 205.1161 (1979): 581-598.

Topics: Natural selection, Exaptation, and Selective Transparency & Evolution of Behaviors & Fitness with Competition

Feb 23th – Quiz #2 released

Reading: Nesse & Williams, Why We Get Sick, Chapter 3

Topic: Co-evolution & Signs and symptoms of infectious disease

Mar 7th – Reading: Nesse & Williams, Why We Get Sick, Chapter 4

Topic: Co-evolution and infectious disease & Disease and Selection

Mar 14th – Quiz #3 released

Topic: Public Health, Infection Prevention, and Eradication & Review for Midterm

Mar 28th – Midterm Exam

April 4th – Quiz #4 released
Reading: Nesse & Williams, Why We Get Sick, Chapters 5 & 6
Topic: Injury & Toxins

April 11st – Reading: Nesse & Williams, Why We Get Sick, Chapters 11 & 12
Topic: Allergy, Immunity, and Cancer

April 18th – Quiz #5 released
Reading: Nesse & Williams, Why We Get Sick, Chapter 14
Topic: Mental Illness

Apr 25th – Reading: Nesse & Williams, Why We Get Sick, Chapter 7
Topic: Genetic Disorders, Eugenics, Gene Therapy, and Evolution

May 2nd – Quiz #6 released
Reading: Nesse & Williams, Why We Get Sick, Chapter 13
Topic: Sex and Reproduction

May 9th – Topic: Review, Recap, and expectations for final projects

May 17th – Final projects due.

Four Very Important Disclaimers for Entire Course: *If these things will bother you, you might want to switch to a different course*

Distractions: I will go off-topic on purpose. We will get distracted by conversations.

Class Slides: These are short and incomplete. They are not meant to capture everything we will talk about, nor be a complete list of concepts. They are there to get the conversation started. If you miss class, please get someone's notes.

Being Right: I think it's much more important to be able to make good arguments than to get the right answer. An unsupported, poorly supported, or incorrectly supported "right answer" will be graded as wrong in this course.

Religion: I don't care (or want to know) what you personally believe. What you believe has no bearing on your understanding of what an evolutionary argument should look like. In this course, you will be expected to make logical, scientific arguments well (regardless of whether or not you find them personally compelling). We will *not* discuss personal religious beliefs *at all* during this class.

The instructor reserves the right to revise, alter or amend this syllabus as necessary. Students will be notified in writing / email of any such changes.