

IB 534: Evolution and Medicine

Course Description

Our health is inseparably tied to our evolutionary history. As a result, evolution is an important underpinning discipline for health professionals. This course first provides an overview of evolutionary processes, molecular evolution, human evolution, life history theory, and evolutionary-developmental biology. Second, it illustrates the application of these principles to our understanding of nutrition and metabolism, reproduction, disease and stress, and behavior. Third, it shows in practical terms how the principles of evolutionary medicine can be applied in medical practice and public health.

This course is 4 credit hours and does not have any prerequisites. It counts towards one of 5 required biology courses in the Online Master of Science Teaching Biology Program with the School of Integrative Biology.

Course Goals and Objectives

Upon completing this course, students will be able to:

- Understand how our evolutionary history has impacted human health.
- Explain evolutionary principles as they apply to human health.
- Apply these principles to our understanding of nutrition, metabolism, reproduction, disease and stress and behavior.
- Show in practical terms how evolutionary medicine can be applied to medical practice and human health.
- Learn to develop and critique novel hypotheses in evolutionary medicine.

Instructor Information

Joanne Manaster

University of Illinois at Urbana-Champaign

Contact Information

Office Phone: 217-244-2489

E-mail: joannema@life.illinois.edu

Virtual Office Hours: TBD

About Me

I've been teaching at the University of Illinois for over 27 years. My specialties are cell and molecular biology with histology being one of my favorite topics. I am especially interested in the medical applications of biology. Prior to online teaching, I coordinated and taught upper level labs for nearly 20 years in the School of Molecular and Cellular Biology and the Department of Bioengineering.

For this program I teach IB 531: Emerging Infectious Diseases, IB 533: Human Genome and Bioinformatics and IB 534: Evolution and Medicine.

Course Structure

This is a **4-credit hour** course. The course is **8 weeks** long and consists of 8 content modules. Please be aware that this course is accelerated in nature; 16 weeks' worth of content will be covered in a 8-week time span. You should dedicate approximately **12–16 hours** per week to working on the course itself, but actual time commitments will vary depending on your input, needs, and personal study habits. You are required to log on to the course website a minimum of **4 days per week** but as discussions develop, you will probably need to do so more frequently.

This course is designed with the principles of collaborative learning, constructivism, and active participation in mind. You are encouraged to share your thoughts and engage in problem-solving. The course has a consistent and predictable structure, organized around the weekly modules, with a course website that is straightforward and easy to navigate. Instructions and due dates for activities and assignments are clearly articulated so that you know what is expected of you and will be able to easily stay on track.

We realize that you have a life beyond the scope of this course. However, if you are unable to complete an assignment because of professional obligations, you should notify the instructor or, better yet, prepare the assignment ahead of time and post it early. This will give your classmates a head start in reading and responding to your work. Most assignments are due by 11:55 PM of their respective due dates as listed on the course calendar, giving you and your classmates time to read and comment on each other's work before the next module begins.

Readings and responses to discussion questions should be read and submitted during the module for which they are assigned in order to get the most benefit from the discussions. At the end of each content module, participants will have an opportunity to make sure that they have completed all the required activities and assignments.

Textbooks

Principles of Evolutionary Medicine by Gluckman, Beedle and Hanson, 2nd edition.
ISBN: 0199663939

The textbook can be purchased through [the Illini Union Bookstore](#) or elsewhere.

Accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, students should contact both the instructor and the Disability Resources and Educational Services (DRES) as soon as possible. You can contact DRES at 1207 S. Oak Street, Champaign, (217) 333-1970, or via email at disability@illinois.edu.

Academic Integrity

All students are assumed to have read and understood the “Code of Policies and Regulations Applying to All Students,” University of Illinois, and will be expected to act accordingly.

The Code is available online at <http://www.admin.uiuc.edu/policy/code/index.html>

Articles and e-Reserves

Other reading materials and e-reserves will be listed in the weekly Module Overview pages within the course website.

Course Outline

Week 1: Evolutionary Theory and Molecular Basis of Human Variation

In this module, you will be introduced to the field of Evolution in Medicine and how it can be a very useful perspective for both those in the medical field and for evolutionary biologists. You will also be doing a review of evolutionary theory and the basis of human genetic variation..

Week 2: Evolution and Human Development

In this module, you will be learning about the concept of developmental plasticity and how the environment influences how an organism ultimately develops and the effects on future health.

Week 3: Evolution of Life Histories

In this module, you will be learning about the health trade-offs that come during the typical human life history, learning the flow from birth, childhood, adolescence through senescence.

Week 4: Human Evolution and the Origins of Human Diversity

In this module, you will be exploring the key elements in human evolution, how humans have adapted to different environments during their evolution and the genetic changes that make us human.

Week 5: Reproduction and Evolution

In this module, you will be exploring various aspects related to reproduction including mate choice, why females menstruate, sex ratio determination in a population, the difficulties of childbirth, maternal-fetal interactions and menopause.

Week 6: Nutritional and Metabolic Adaptation

In this module, you will learn how an organism's ability to adapt to food availability is a major point where natural selection can act. You will also examine how obesity and other metabolic disorders result from a mismatch between our bodies and the modern diet.

Week 7: Defenses and Social Organization and Behavior

In this module, you will be looking at the roles that stress as well as infectious and autoimmune diseases play in the overall health of an individual and how these are evolutionarily linked. Virulence, antibiotic resistance, vaccinations, asthma and allergies will all be examined.

Additionally, you will look at how human social structure has changed and how this is the underpinning of the subfield of evolutionary psychiatry. Altruism, personality disorders and psychoses all seem to be related to evolution of human interactions.

Week 8: Ultimate Mechanisms Affecting Disease Risk and Evolutionary Perspectives on Cancer

In this module, you will review the mechanisms that affect disease risk and learn how evolutionary principles can be applied to medical practice and will also take a look at how evolution may play a role in the development of cancer and the implications for prevention and therapy.

Course Activities

Grading Scale

Letter Grade	Percentage Range	Point Range
A+	97.00–100.00	698.4–720
A	92.00–96.99	662.4–698.3
A-	90.00–91.99	648–662.3
B+	87.00–89.99	626.4–647.9
B	82.00–86.99	590.4–626.3
B-	80.00–81.99	576–590.3
C+	77.00–79.99	554.4–575.9
C	72.00–76.99	518.4–554.3
C-	70.00–71.99	504–518.3
D+	67.00–69.99	482.4–503.9
D	62.00–66.99	446.4–482.3
D-	60.00–61.99	432–446.3
F	0–59.99	0–431.9

You are expected to complete your work independently, in accordance with [University policy](#). Failure to do so will result in strict disciplinary action, including loss of all credit for the assignment, notification of a dean, and possible dismissal from the University. You may work with others on homework, but the final product must be your own.

Assignments, Weights, and Deliverables

You can access your scores by clicking the **Grades** link from the left column of the course home page.

All interim and final deliverables have due dates. Failure to meet deadlines results in a reduction of the assignment points. For the due dates of each assignment, please see the course calendar.

Point Distributions

Assignments	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8			Total points per assignment	Relative weight
Why Do Humans HAVE That? Presentation										50	50	7%
Discussions	25	25	25	25	25	25	25	25			200	28%
Self-Assessment Quizzes	10	10	10	10	10	10	10	10			80	11%
Wiki Project					140						140	19%
Final Project									250		250	35%
Total											720	100%

Module Overview

Each module will begin with the module overview, explain what the module is about, what learning goals you are expected to achieve, how long the module will take, and in what activities you will participate. Each module is designed with the same structure and activities unless otherwise specified. The module activities are explained in greater detail below. You can find the due dates of specific assignments in the course calendar.

Synchronous Sessions

Each week there will be an optional synchronous session in which all students will join together online at the same time to talk. These sessions will use *Blackboard Collaborate* to join all participants together in a session where you can text chat, voice chat, and see the computer desktop of the instructor.

Weekly Self-Assessments

Weekly Self-Assessments are brief summative assessments to double check your knowledge of the material presented in the readings and lectures.

Why Do Humans HAVE That? Presentation

The human body can be quite perplexing. We have body parts of unknown use but if we examine them enough we can discover their origins. Through this exercise, we will become familiar with these oddities. You will explore why humans presumably either retain or have developed these structures from an evolutionary standpoint and their implications for human health. Each week, these students will present information during the synchronous session. Ideally, you will discover where these structures first appeared in phylogeny (i.e. which organism first displayed these structures)

Why Do Humans DO That? Individual Wiki

The goal of this Individual wiki is to explore evolutionary reasons for symptoms or traits humans have in detail and then write a summary of your findings. Later, in a separate individual reflection exercise you will review the summaries of other topics developed by your fellow students.

Final Project

The goal of the final project is to look deeply at diseases and disorders from an evolutionary perspective. The project requires that you use the information we have learned in the course, demonstrating your mastery of the material, to come up with your own theories (with supporting documentation) as to why our bodies sometimes fail us. The format will be a Powerpoint presentation (or similar, such as Prezi or a Google slideshow), with a slide and word limit.

A note about sources of information: It is highly recommended that you primarily consult the following sources of information in studying for this class. Use Google-discovered sites with caution and a skeptical eye, as you probably are aware.

- Suggested books and required readings
- Supplemental information posted on course website
- Internet links provided in class or on course website