IB 150 SU 2017
Organismal and Evolutionary Biology
Syllabus

Course Description

IB 150 is both an introductory course for biology majors, and an excellent, comprehensive survey course for non-majors who are looking for a course to brush up on biology for GRE biology subject exams, MCAT, and similar biology graduate-entrance exams, or anyone interested in exploring the big questions of life to fulfill their Natural Science general education requirement.

As we will see, all the properties we associate with living organisms can be grouped around 2 core concepts: the ability to pass on genetic information between generations, and obtaining the energy required to drive all of life's many chemical and physical reactions.

It is these two core principles that this course is built around: In Unit 1 (weeks 1 & 2) we will be focusing on how life is structured around this need to obtain energy. In Unit 2 (weeks 3 - 5) we will be covering that other core concept: heredity and its consequences for living organisms. Finally, in Unit 3 (weeks 6 - 8) we will apply what we learned about the forces that shape all living organisms in a holistic way to understand why organisms are built the way they are, including an overview of their evolutionary history, development, and comparative physiology and anatomy.

Given the 8 week nature of summer courses, this course will move through material quickly. It is important that you stay on top of the schedule and complete assignments earlier rather than later so as not to have everything pile up towards the due dates at the end of each week. I recommend to begin each week by browsing through the recommended textbook readings, listed near the top of each week's module, followed by working through the **lectures**, followed by the activities. Please note that many of the activities contain an interactive portion that requires you to upload parts of your work in forums where your peers can learn from what you posted.

We will all learn better and have a successful semester if we work together in a lively, interactive atmosphere! We have a very diverse set of students this semester, including many non-majors and bio majors. If you feel comfortable with this material, browse through the Q&A forum this week and help answer some of your class mate's questions. If you felt confused, take advantage of the fact that there are likely some of your classmates that can help explain the material to you, so ask your questions in the Q&A forum early in the week to get help. Or perhaps you disagree with me on some topic during **lectures**, such as what it means to be alive, and would like to engage with your classmates to discuss your thoughts and ideas.

You can always arrange to meet virtually anytime with your classmates in the Study Lounge at the very top of the main moodle page to form study groups with other classmates and chat or video-chat about what confused you. This is also the location where I, your TA, and your peer mentor will hold our weekly office hours.

I am looking forward to an engaging and interactive semester with you.

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 an 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 weekly Overview pages, 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 and Other Required Materials

(Recommended) Freeman. ***Biological Science*****, eText of 5th edition**. Pearson. (Purchasing a paper copy of the text is also possible. However, make sure that you purchase access to Learning Catalytics separately in that case. See **Required Course Materials** for more information).

(**Required**) If you chose not to purchase access to the textbook, you HAVE to get stand alone access to MasteringBiology that comes included with LearningCatalytics. Instructions for doing so are under the START HERE links right before the Unit 1 modules begin on the main page.

A non-programmable calculator *other* than your smart phone.

Articles and e-Reserves

Other reading materials and e-reserves will be listed in the weekly **Readings and Additional Resources** pages within each week's module.

Course Activities

Grading Scale

Letter Grade	Percentage Range	Point Range
A+	>100	>995
A	93–99	925–994
A–	90–92	895-924
B+	87–89	865-894
B	83–86	825-864
B–	80–82	795-824
C+	77–79	765-794
C	73–76	725-764
C–	70–72	695-724
D+	67–69	665-694
D	63–66	625-664
D–	60–62	595-624
F	0–59	0-594

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 **Gradebook** link from the top 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 Week Overview link in each week's module.

Point Distributions

Assignments	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Total Points	Course %
Lecture	15	15	15	15	15	15	15	15	120	12.0%
Activities	20	20	20	20	20	20			120	12.0%
Live attendance	20	20	20	20	20	20	20		120*	12.0%
Discussion	10	10	10	10	10	10	10		60*	6.0%
Quizzes	10	10	10	10	10	10	10		70	7.0%
Exams		110			200			200	510	51.0%
Q&A Forum (Extra Credit)	2	2	2	2	2	2	2	2	**5.4% extra credit**	
Answering Peers (Extra Credit)	4	4	4	4	4	4	4	4		

***) lowest discussion score dropped**

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 on the next page **Course Outline**. You can find the due dates of specific assignments in the weekly Overview pages.

Synchronous Discussion Sessions

Each week there will be live, synchronous discussion sessions in which all students will join together online at the same time with your TA to review difficult concepts and practice working through problems similar to those on the hour exams. These sessions will use *Blackboard Collaborate* (formerly known as *Elluminate Live!*) to join all participants together in a session where you can text chat, voice chat, and see the computer desktop of the instructor. These sessions allow you to work through worksheets in small groups that contain problems that are very similar to problems that you will encounter on the hour exams. Worksheets will be turned in through *Learning Catalytics* which comes with the eText version of your textbook, or access to the *Learning Catalytics* software can be purchased separately (see info on textbook above).

Exam Information

There are 3 hour exams in this course consisting of a combination of multiple choice and short essay questions. Exams are proctored, closed book, closed notes, NOT cumulative and are based on the learning objectives of the lecture and activity lessons of each respective unit.

You can either take your exams on the Urbana-Champaign campus of the University of Illinois or via ProctorU.

Exam Options

Option 1: On-Campus: If you wish to take the exams at the Urbana-Champaign campus, they will be held on from 4-5 pm on the exam days in 485C Burrill Hall.

Option 2: ProctorU: ProctorU is an online proctoring service that allows students to take exams online while ensuring the integrity of the exam for the institution. The service authenticates your identity and monitors both your computer screen and webcam to ensure academic integrity. Exams will be proctored online by logging into ProctorU. A webcam and *reliable* internet connection are prerequisites to being able to access and successfully complete the exams:

- You will have 1 hour to complete each exam. You may begin the exam at any time between 3 pm and 11 pm CDT on the exam day.
- ProctorU is a fee-based online proctoring service ($14.75 /1-hour exam) billed when you schedule the exam. Refunds are given only if the exam is canceled within 48 hours before the scheduled exam time.
- All appointments should be made at least 3 days in advance, since reservations made within 72 hours of your exam are subject to a $5 late reservation fee.
- Web cam, microphone, and computer with internet connection are required.
- **ProctorU System Requirements and System Test**

- **How to Schedule Your Exam with ProctorU**

A note about sources of information: It is highly recommend that you only consult the following sources of information in studying for this class. Use of another source (such as Internet sites found via Google) may provide information that is unreliable.

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

Getting Help

If you need help:

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  - Only contact your instructor directly if you have a personal question.
  - For all other questions about course content, activities, deadlines, technical problems, etc., please check the **General Q & A** forum to see if someone else has already asked your same question and received a response.
  - If your question isn't there yet, post your question to the **General Q & A** forum. Feel free to help your peers out if you know the answer!
  - If you have technical problems, please fill out **this form**.

Course Outline

Unit 1: Life and Energy

Week 1 - What Does It Take to Be Alive

In this module, we will explore the minimum requirements of living systems, with focus on the need to obtain energy to drive life's many reactions, and follow the trail of energy through cellular respiration and photosynthesis all the way back to the ultimate energy source for (almost) all life: the Sun.

- **Lectures**
  - 1. Fundamental Properties of Life
  - 2. Two Kinds of Molecules That Power Life
  - 3. Cellular Respiration
- **Activities**
  - Intro to Scientific Method: Enzymes and Homeostasis
- **Textbook Readings**
  - Chapter 1.1-1.2; Chapter 2.1; Chapter 3.2-3.4; Chapter 8.1-8.4; Chapter 9.1-9.6

Week 2 - How Do Organisms Interact with Their Enviornment?

In this module, we will explore how the need for obtaining energy structures living systems, from the physiology of an individual organism, to limits on population growth, the interactions between organisms, and ultimately the structure of ecosystems.

- **Lectures**
  - 1. Photosynthesis
  - 2. Population Growth and Life History Traits
  - 3. Community and Trophic Interactions
- **Activities**
  - Trade-Offs among Metabolic Strategies
  - Working in a Research Lab: Dr. Evan DeLucia on Feeding the World in a Changing Climate.
- **Textbook Readings**
  - Chapter 10; Chapter 54.1; 54.3-54.4; Chapter 55.1; Chapter 56.1-56.2.

Unit 2: Heredity

Week 3 - How Do Organisms Pass on Their Traits?

In this module, we take a closer look at how genetic information is stored, how genes encode the physical features of an organism, and how the genetic information is passed on from one generation of cells or multicellular individuals through asexual (mitosis) and sexual (meiosis & fertilization) reproduction.

- **Lectures**
  - 1. Molecular Basis of Heredity
  - 2. Passing on Your Genes
  - 3. Sexual Reproduction
- **Activities**
  - Understanding Mitosis and Meiosis
- **Textbook Readings**
  - Chapter 12.1-12.3, Chapter 13, Chapter 16.

Week 4 - Why Do Organisms Have Sex?

In this module, we explore the consequences of sexual reproduction on the genetic diversity of the offspring, how setting up genetic crosses can lead to a deeper understanding of how organisms inherit information, and help to build maps of the entire genome of an organism.

- **Lectures**
  - 1. Fertilization and Simple Genetic Crosses
  - 2. Sex Linkage and Inheritance of Multi-Gene Traits
  - 3. Linkage and Gene Mapping
- **Activities**
  - **Solving Genetic Riddles**
  - Working in a Research Lab: **Dr. Carla Cáceres on When to Reproduce Sexually**
- **Textbook Readings**
  - Chapter 14

Week 5 - How Do Populations Evolve?

In this module, we explore how sexual reproduction affects genetic diversity in populations and how both random and non-random forces can alter the frequency of alleles of genes in a population, leading to evolutionary change.

- **Lectures**
  - 1. When Populations Aren't Evolving: Hardy-Weinberg Equilibrium
  - 2. When Populations Evolve Randomly: Genetic Drift and Gene Flow

    - 3. Non-Random Evolution: Natural Selection
- **Activities**
    - **Population Genetics**
- **Textbook Readings**
    - Chapter 25.3, 25.5; Chapter 26

Unit 3: Integrative Topics

Week 6 - Macroevolution

In this module, we explore what conditions can lead to the formation of new species over time, how we can determine the relationships between different species, and end with a broad overview of the major events in the history of life on Earth.

- **Lectures**
    - 1. Speciation
    - 2. Cladistics: Mapping Evolutionary Relatedness
    - 3. History of Life on Earth
- **Activities**
    - The Great Clad-Race
    - Working in a Research Lab:
        - **Dr. Gene Robinson on Nature versus Nurture of Behavior**
- **Textbook Readings**
    - Chapter 27; Chapter 28.1-28.3

Week 7 - Genes, Development, and Evolution

In this module, we take a closer look at how a multicellular organism can arise from a single, fertilized egg cell through mitotic cell divisions. We will focus on the major phases of embryonic development and investigate the molecular underpinnings of cell differentiation and genetic control of pattern formation in the developing embryo.

- **Lectures**
    - 1. Differential Gene Expression Determines Development
    - 2. Embryogenesis: Hox Genes and the Evolution of Body Plans
    - 3. Metabolic Requirements dictate Anatomy
- **Activities**
    - Working in a Research Lab: End-semester written assignment: Research Proposal (due end of week 8)
- **Textbook Readings**
    - Chapter 19.2-19.4; Chapter 22; Chapter 23.1-23.3; Chapter 42. 3; Chapter 45.1-45.3

Week 8 - Physiological Requirements and Evolutionary History Determine the Anatomy of Organisms

In this final module, we bring all that we have learned this semester together, in order to understand one aspect of an animal's anatomy - the circulatory system - from a holistic perspective using a comparative anatomy approach: What physiological trade-offs help predict the structure and function of circulatory systems in different animals? What are the associated selection pressures that drove the evolution of these different solutions? What role does serendipity play in the evolutionary history of a lineage that "locks" an organism into developmental or physiological constraints that limit the potential to explore alternatives in the construction and design of these organ systems?

- **Lectures**
  - 1. A Comparative Anatomy Approach to the Circulatory System
- **Textbook Readings**
  - Chapter 45.4-45.5