

IB 271 – Organismal Biology, Spring 2024 Syllabus

Class meeting times: MWF 11-12 (lectures), W 1-5 (labs), 4014/4016 Natural History Building

Prerequisites:

IB 150 (Organismal & Evolutionary Biology) and MCB 150 (Molecular & Cellular Basis of Life)

Instructors:

Plant Section	Animal Section
Professor Li-Qing Chen	Professor Chris Cheng
379 ERML	17 Burrill Hall
Phone: 217-265-9459	Phone: 217-333-2385
Email: lqchen77@illinois.edu	Email: c-cheng@illinois.edu
TA for the plant section	TA for the animal section
Scott Lakeram	Abby Weber
Office: 139 Morrill Hall	Office: Victor E Shelford Vivarium
Email: lakeram2@illinois.edu	Email: aweber8@illinois.edu

Plant section – Prof. Li-Qing Chen (1st 7 weeks | January 17 – March 05, 2024

About me:

I am an Associate Professor in the Department of Plant Biology and affiliated with the Carl R. Woese Institute for Genomic Biology and Center for Digital Agriculture. My lab is interested in control of sugar flux in plants. We are studying how the process of sugar allocation from the photosynthetic tissues to non-photosynthetic tissues is controlled and regulated using molecular, biochemical and genetic tools. The ultimate goal is to improve global food security by engineering sugar flux in crops.

Section description:

What and how do we know about plant biology? This course is designed to provide you with a broad overview from different perspectives including plant cell biology, plant metabolism and plant developmental biology. You will be able to apply your gained knowledge to better explain phenomena in the plant biological world and better evaluate the challenge of global issues, such as food security, we are facing.

Section Objectives:

Upon completing this course, students will be able to

1. Distinguish how plants are different from other organisms.
2. Understand the primary metabolic processes in plants
3. Explain how plants respond to environmental cues.
4. Understand how plant physiology helps to resolve some issues we are facing.

Textbook:

The basic textbook is Campbell Biology by Lisa Urry, 12th ed, but 11th ed would work. Substantial other materials or readings will be provided by the instructor on Moodle.

Animal section – Prof. Chris Cheng (2nd 7 weeks | March 06 – May 1, 2024)

About me:

I am a Professor in the Dept. of Evolution, Ecology and Behavior (EEB) in SIB. I study cool (literally) polar fishes, on how they evolve and adapt to freezing conditions in the Antarctic and Arctic waters. I also study how land insects survive freezing winters. The unifying adaptive trait is antifreeze proteins, which are diverse in structure and genetic origins. I work across levels of organization, from genes and genomes, to proteins, to whole animals and field biology. This integrative approach allows me to understand the interplay of

environmental driving forces and animal response and adaptation, and the underlying mechanisms at the biochemical, molecular, genomic and evolutionary levels.

Section description:

This Section aims at achieving a solid understanding in two major related areas: (i) diversity and evolutionary relationships of major animal lineages, and (ii) fundamentals of physiology and physiology of animals in diverse environments. The goal is to instill an understanding and strong appreciation of the animal world, and the remarkable forms and functions they evolved that are compatible with life in their particular niches.

Section Objectives:

Upon completing this section, students are expected to:

1. Become familiar with the major phyletic lineages that comprise animal diversity
2. Understand evolutionary relationships among lineages through molecular phylogenetics reconstruction
3. Understand basic organ and system physiology of animals including human (partly).
4. Understand adaptive physiology of animals in different environments.

Textbook and instruction materials:

The basic text book is Campbell et al. BIOLOGY, 12th ed. Journal papers and instructor prepared information comprise a substantial part of the lecture material.

Grading components for each section - (50% for each section)

COMPONENT	COMPONENT SUBTOTAL	% of FINAL GRADE
• Prelab/postlab activities (6 @ ~ 8.4 pts each)	50 pts	5%
• Lab reports/presentation:	200 pts	20%
- One formal lab report	120 points	
- One popular science essay	50 points	
- Lab poster/PPTX presentation	30 points	
• Pre-lecture assessments/literature discussion and/or short writes (~10 @ ~5 pts each)	50 pts	5%
• Exams (2 @100 pts each)	200 pts	20%
Section Total	500 pts	50%

Extra Credit:

There are three ways to earn up to **4 % overall extra credit** for the whole course.

- **Lab journal submission (3 %):** You can choose to submit up to 6 (3 for the Plant Section, and 3 for the Animal Section) in-person lab journals, 5 points for each lab journal.
- **Student surveys (0.5 %):** We very much value your feedback for continually improving our teaching and this course! Participation in two formal (ICES) surveys, one for each section, will earn 0.25% each.
- **Five-minute writes (up to 0.5 %):** You will be asked to address a few short questions after a lecture to assess your learning outcome from the lecture of the day several times, 1 point for each write-up.

Grades Assignment - will follow the +/- scheme.

Notes regarding expectations for written work:

IB271 is set up to satisfy the campus requirement of Advanced Composition for your degree program. This means, by completing IB271, it exempts you from having to take RHET233 separately. It aims to help you gain scientific writing skills. The advancement of science requires articulation of research studies and result outcomes in clear and understandable prose. You have started learning these skills in the first IBH

core course. IB271 emphasizes further development of your skills in reading, synthesizing and writing scientific material. As you may have noted in the grading breakdown above, lab reports and lab presentation make up 40% of the final course grade, equal weight as the lecture exams. These exercises require significant writing effort on the part of the students, and a significant commitment on the part of the instructors to give feedback. Be cognizant that your grade relies heavily on your written performance. Students are expected to make best effort in exam answers and lab reports to cite literature and examples that acknowledge contributions of scientists from diverse populations.

This course treats everyone with respect as valued students regardless of appearance or expressed gender preferences, as any race or gender can be a great contributing scientist.

Written assignments and exercises include the following:

1. Laboratory journals (optional for extra credit)– For any scientist, the daily record of her/his work – written in a way that it can be found and understood six months or six years from the date of the writing – is essential to progress. To be most effective, the journal entries really must be made during, or immediately after an experiment, observation or cogitation. In this course, you will be required to keep a laboratory notebook for in-person labs. Raw data and initial analyses will normally be recorded in a physical lab notebook. Processed data, summaries, conclusions and notes should be kept electronically. After every experimental lab period on Wednesday afternoon, you will have to upload the word file to Moodle on Thursday for evaluation if you wish to earn extra credit. The specific requirement for a lab journal submission will be posted on Moodle. The lab electronic notebooks will be returned on Friday. **Bear in mind, this is a transferable skill that will help you when you participate in the IBH required independent research (IB390, IB490) in a faculty lab, as record keeping of your work is always expected and needed.**

2. Prelab or postlab activities: Multiple choice questions or short answer questions will be given.

3. Lab reports:

(i) One formal lab report from each section, *i.e.* **two for the semester.**

For the Plant Section - the formal report will be prepared from the results of lab 4 (Chloroplast Pigments and Proteins) in combination with lab 3, or lab 5 (Photosynthesis/Starch).

For the Animal Section - the formal lab report should be prepared from the results of either labs 1 and 3 (Evolutionary relationship analyses), or labs 4 and 5 (Osmotic strategies).

Guidance on writing – The culmination in formal scientific investigation is published research reports. To experience this, you will submit lab reports in the format of a journal manuscript. While you may discuss results with your peers, **the report must be single-authored.** The paper should be precisely patterned after and formatted as a journal publication, with the following general stipulations:

- Abstract – word limit 500; a very concise synopsis of why and how you did the study, what results you obtained, and an evaluation of whether they support your hypothesis.
- Introduction – background and any hypothesis/hypotheses that were specifically tested
- Materials and Methods – organized in subsections with subtitles
- Results and Discussion – organized in subsections with subtitles
- Conclusion – word limit 500.
- Bibliography

(ii) A shorter report/essay will be prepared from research literature on a topic relevant to the course. This short report will be **in popular science style**. Again, **the small report must be single-authored.**

- Make sure your writing is suited for a non-specialist audience;
- Make the title short and catchy;

- Begin with a general background introduction about your project;
- Describe the methods and techniques only briefly;
- Simplify results, but be accurate;
- Avoid jargon.

Writing feedback – To satisfy the **Advanced Composition** requirement, each paper will be evaluated with the expectation of at least one subsequent revision. Students will submit a first draft of the reports at a specified time (in the calendar at the end of this document) for comments by the TA and instructor. The final report should include improvements that incorporate TA/instructor suggestions.

4. Lab presentations:

- **Lab posters (Plant Section)** – You will pair with another student and prepare and present a poster on one lab (or set of labs) or research literature different from the one you use for pop sci. More specific instructions will be provided by the instructor/TA.
- **Lab oral presentations (Animal Section)** – You and your group members will prepare and give an oral PowerPoint presentation on a lab of your choice. More specific instructions will be provided by the instructor/TA.

5. **Pre-lecture assessments/short writes** – Pre-lecture assessments are chapter based. Each chapter has 20 multiple-choice questions. This assessment applies to both sections. For the plant section, in-class literature discussions are included to guide students on how to read a scientific paper. Short writes are homework writing exercises of one or two paragraphs or a problem set on a topic or particular interest relevant to class lectures.

6. **Exams** – Two exams are scheduled for each section. They will be **take-home exams**.

Attendance/participation:

Lectures and labs will be all in-person, unless notified otherwise. Students are expected to attend all scheduled classes and labs, participate in class discussion, quizzes, and perform all required lab activities. Students are required to mute phones, laptops, and tablets. Lecture slides will be posted on Moodle before classes. Slides are subject to revision after lectures are delivered. Please watch announcements in the news forum of Moodle or class emails closely for updates.

Statement of Academic Integrity

The Academic Integrity Policy and Procedure from the Student Code (<http://studentcode.illinois.edu/article1/>) will apply in all instances of academic misconduct committed by students. This applies to all exams, lab reports and quizzes. Infractions of academic integrity regulations are taken seriously and can result in severe consequences, including expulsion from the University. As a student of the University, it is your responsibility to become familiar with, understand, and abide by the Academic Integrity section of the Student Code. It should be noted that ignorance of these regulations is not a defense in cases of infringement of the rules of academic integrity.

Type of violation

See http://admin.illinois.edu/policy/code/article1_part4_1-402.html for complete definitions.

Violation Type	Description
<input type="radio"/> 1-402a: Cheating	Using unauthorized materials or information, e.g. in an exam.
<input type="radio"/> 1-402b: Plagiarism	Representing the words or ideas of others as your own; includes coding.
<input type="radio"/> 1-402c: Fabrication	Submitting made-up information or false documents.
<input type="radio"/> 1-402d: Facilitating infractions by others	Helping others cheat, plagiarize, etc.
<input type="radio"/> 1-402e: Bribes, favors, and threats	With the intent to affect a record of a grade or evaluation of academic performance.
<input type="radio"/> 1-402f: Academic interference	Including but not limited to computer facilities, electronic data, required/reserved readings, reference works, or other library materials.

Accommodations

Your success in studying this course is important to us. If you are unable to complete your lab reports or exams, because of professional or personal obligations or emergency situations, you should notify the instructor IMMEDIATELY. Accommodations must be clear and brief. Decisions will be made on an individual basis. If you have a disability, please send the instructor a Letter of Academic Accommodations within the first two weeks of the semester. You can learn how to get a Letter of Academic Accommodations from DRES by following this link (<http://disability.illinois.edu/academic-support/accommodations>).

Please reference the Community of Care's Request for Accommodation for Religious Observances page (<https://odos.illinois.edu/community-of-care/resources/students/religious-observances/>). This links to the Request for Accommodation for Religious Observances form that should be completed for those students seeking religious accommodations."

***NOTE: Syllabus is subject to minor adjustments during the semester to build in flexibility.**

Chen - Plant Section Schedule:

Date	Topic	Pre-class reading & assessment	Assignment schedule (may change as needed)
01/17(W)	Introduction: why study plants?		Prelab 1 activity due before lecture
	Lab 1 - Greenhouse tour and scavenger hunt		Postlab 1 activity due on Thursday
01/19 (F)	Plant body establishment	Chapter 35	
01/22 (M)	Plant growth	Chapter 8	
01/24 (W)	Energy flow (enzyme and cellular respiration)	Chapter 9	Prelab 2 activity due before lecture
	Lab 2 - soluble sugar extraction and measurement from veggies		Postlab 2 activity due on Thursday
01/26 (F)	Literature discussion		
01/29 (M)	Energy flow (Photosynthesis 1)	Chapter 10	Pop science draft due on Tuesday
01/31 (W)	Energy flow (Photosynthesis 2)		Prelab 3 activity due before lecture
	Lab 3 - protein extraction and measurement from veggies		Postlab 3 activity due on Thursday
02/02 (F)	Energy flow (Photosynthesis 3)		Pop science draft return Take home exam 1 post
02/05 (M)	Energy flow (Photosynthesis 4 and photorespiration)		Pop science due on Tuesday
02/07 (W)	Sucrose, starch and phloem transport	Chapter 36	Prelab 4 activity due before lecture
	Lab 4 - Chloroplast pigments and proteins		Postlab 4 activity due on Thursday
02/09 (F)	Literature discussion		Pre-poster preparation Take home exam 1 due
02/12 (M)	Water transport	Chapter 37	
02/14 (W)	Nutrient acquisition		Prelab 5 activity due before lecture
	Lab 5 -Photosynthesis and starch		Postlab 5 activity due on Thursday
02/16 (F)	Plant growth regulation	Chapter 39	
02/19 (M)	Plant growth regulation		Formal lab report-Results/Discussion draft due
02/21 (W)	Responses to biotic stress		Prelab 6 activity due before lecture
	Lab 6 - Transpiration and stomata		Postlab 6 activity due on Thursday Formal lab report-Results/Discussion draft return on Thursday
02/23 (F)	Literature discussion		Formal lab report - Abstract/Intro draft due
02/26 (M)	Response to abiotic stress		Formal lab report - Abstract/Intro draft return Take home exam 2 post on Tuesday
02/28 (W)	Response to abiotic stress		
	Lab 7 - Poster preparation		Form Lab report due on Thursday
03/01 (F)	Poster presentation		
03/04 (M)	Poster presentation		Take home exam 2 due on Tuesday

Cheng - Animal Section Schedule:

Date	Topics	Pre-class reading & assessment	Assignment schedule (may be adjusted as needed)
03/06 (W)	Evolution of life and diversity on Earth	Chapter 26	
	Lab1 – Evol analysis part 1_PCR amp and sequencing of mt COI		
03/08 (F)	Methods of reconstructing evolutionary relationships	Chapter 25	
03/11– 03/15 SPRING BREAK week			
03/18 (M)	Phylogenies of animal kingdom	Chapter 32	
03/20 (W)	Phylogenies of animal kingdom/ Invertebrate diversity		
	Lab2 – Anatomical survey of animals across kingdom		
03/22 (F)	Invertebrate diversity and evolution	Chap 33	
03/25 (M)	Invertebrates and Chordata diversity and evolution	Chapter 34	
03/27 (W)	Chordates and Vertebrate diversity and evolution		
	Lab3 - Evol analysis part 2_phylogenetic reconstruction of species tree using mt COI sequence data set		
03/29 (F)	Finish up Vertebrate diversity and evolution		
04/01(M)	Osmotic and ionic balance	Chapter 44	
04/03 (W)	Non-renal and renal osmoregulation		Take home exam 1 posted
	Lab4 – Osmotic strategies part 1_set up experimental aquaria		
04/05 (F)	Non-renal and renal osmoregulation; excretion		
04/08 (M)	Fundamentals of vertebrate immune system	Chapter 43	Take home exam 1 due
04/10 (W)	Vertebrate immune system functions		Formal lab report choice1 (Labs1+3) draft due
	Lab5 - Osmotic strategies part 2_final osmolality and ion concentration measurements of all samples. (Acclimation of crabs and serial acclimation time points samplings will take place between labs 4 and 5)		
04/12 (F)	Circulatory systems and physiology	Chapter 42	
04/15 (M)	Respiratory systems and function		PopSci draft due
04/17 (W)	Respiratory physiology and blood gas exchange		Comments on formal lab report choice1 returned
	Lab 6 – Osmotic strategies part 3_data analyses & synthesis of results		
04/19 (F)	Digestive systems and functions	Chapter 41	
04/22 (M)	Digestive systems and functions		PopSic final due
04/24 (W)	Nervous systems and neuron structures	Chapter 48	Formal lab report choice2 (Labs4+5) draft due
	Lab 7 - Data round table for all labs and Preparations for power point presentation		
04/26 (F)	Nerve signal transmission		Final formal lab report choice1 due
04/29 (M)	Sensory systems, signal transduction	Chapter 49	
05/01 (W)	Motor output		Comments on formal lab report choice2 returned
	Lab7 – PPTX project/selected research topic presentation		
05/02 (Th)	READING DAY		Take home Exam 2 posted
05/07 (Tu)			Take home Exam 2 due
05/10 (F)			Final formal lab report choice2 due