

This syllabus is a general representation of the course as previously offered and is subject to change.

BIOL 457 – Comparative Environmental Physiology

General Course Syllabus (as of January 2020)

About the Course:

Course Description: A survey of physiological adaptations of animals to different environments. This course explores the physiology of vertebrate and invertebrate animals with emphasis on basic principles of physiology and how they are modified by the environment.

Course Format: Lecture

Credits: 3

Prerequisites: BIOL 364

Course Learning Objectives:

By the end of this course, students will be able to:

- Provide examples of physiological solutions to problems, such as animals in various and extreme environmental conditions or animals exhibiting unique life history strategies.
- Apply concepts (on gas exchange, acid-base regulation, water balance, ion/osmotic regulation, and temperature effects/thermoregulation) to explain the relationship between an animal's physiology and their environmental conditions.
- Compare across invertebrate and vertebrate groups to explain the degree to which physiological processes and systems are conserved, as well as how they have been shaped by selective forces during evolution.

Further topic-specific learning objectives will be provided in each lecture.

Textbooks and Additional Resources:

Lecture notes will be posted on Canvas (canvas.ubc.ca).

No required textbook. Supplemental reading from:

- 1) Moyes, CD and Schulte, PM. Principles of Animal Physiology. Benjamin Cummings, New York, 3rd Edition, 2016.
- 2) Randall, Burggren and French. Eckert Animal Physiology: Mechanisms and Adaptations. W.H. Freeman and Company, New York, 5th Edition, 2002.
- 3) Willmer, Stone and Johnston. Environmental Physiology of Animals. Blackwell Science Ltd. 2000.

(All are on hold in the library)

Evaluation:

Assessment	Weight
Midterm Exam I	25%
Midterm Exam II	25%
Final exam (Comprehensive)	50%

All exams consist of short and long essays.

Bonus Marks: Students may attend any of the Comparative Physiology Seminars, and write a brief synopsis (no more than 1 page) of the seminar including the main objectives and hypotheses, what was found and what they learned. This will be worth an additional 0.5% to the final mark for each write-up, up to a maximum of 2%. Hand it in the following Biology 457 lecture. The list of seminars for the semester can be found at: <http://www.zoology.ubc.ca/~brauner/InvitedSeminar.htm>

Schedule of Topics

(Subject to modification)

Week	Lecture Theme	Topic
1	Introduction	- Definitions and environmental physiology
2	Gas exchange	- Implications of breathing water vs air - Transition from water to air-breathing
3	Gas exchange	- Hemoglobin and the Root effect - Bohr-Haldane effect
4	Gas exchange	- Gas exchange during exercise - Hypoxia and altitude
5	Midterm Exam I Gas exchange	- Midterm Exam - Aquatic hypoxia
6	Gas exchange Acid-base regulation	- Diving physiology - Mechanisms of pH Regulation
7	Acid-base regulation	- Responses to CO ₂ in fish - Disturbances related to feeding
8	Researcher lectures	- Guest Speakers

9	Acid-base regulation Midterm Exam II	- Diving turtles - Midterm Exam
10	Water balance Ion/osmotic regulation	- Osmoconformers/regulators - Role of the gills during development
11	Ion/osmotic regulation	- Hypersaline tolerance and the Salton Sea - Ion regulation and the gut
12	Ion/osmotic regulation Temperature	- Ion regulation and metal toxicity - Freeze tolerance/avoidance
13	Temperature Review session	- Thermoregulation - Final Exam Review

University Policies:

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence.

UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom.

UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances.

UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on [the UBC Senate website](#).