

# BIOB34H3 – Animal Physiology

Course Syllabus

Summer 2016



## Instructor

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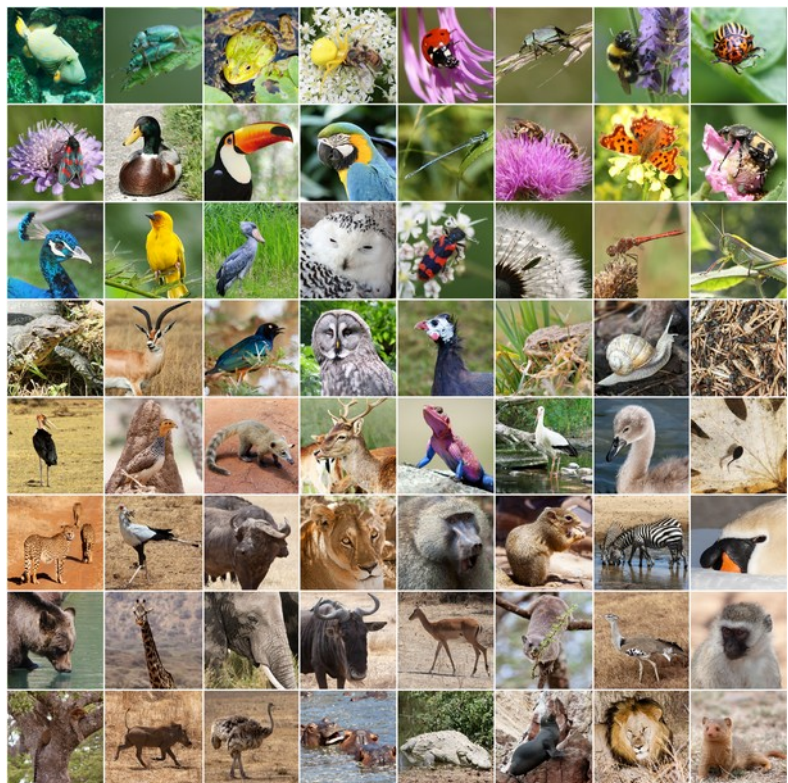
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## Overview

Animal life comes in many diverse forms, but there are core principles that lie beneath the function of every species on Earth. **All animals, including humans, are carbon-based machines who convert chemical energy into ordered molecules, work and heat.** With some very limited exceptions, animals obtain their chemical energy from other photosynthesizing life-forms, which obtain their energy from the electromagnetic radiation of the sun. Natural selection has modified a core set of fundamental cellular mechanisms that are used by all life to produce the many different physiological strategies for survival that we can observe in nature today. This course will provide you with an understanding of these fundamental mechanisms and it will give you an introductory glimpse at the many different ways that they have been shaped and combined by evolution.

## Objectives

You should leave this course with a solid grasp of the core mechanisms that underpin all animal life at the *microscopic* level. As well, you should come to appreciate the rich variety of *macroscopic* systems that these microscopic mechanisms can produce. By understanding both what unites all animals and what distinguishes them, you should develop a “big picture” understanding of animal physiology. The purpose of this course is not for you to memorize the specific physiology of different species. (In the age of Google and Wikipedia memorization is a waste of synapses.) Rather, this course should help you to form the concepts that will serve as scaffolding for your future studies. It should give you a basis for any future



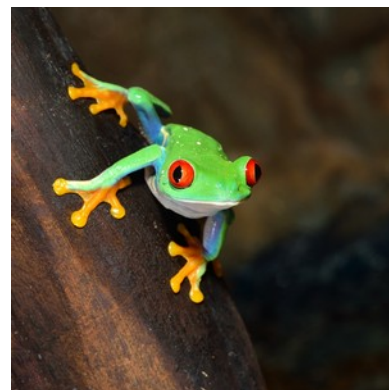
career path you may pursue that requires an understanding of animal physiology, whether that be within academia, medicine, ecology, agriculture or bio-technology.

## General course information

### Teaching assistant

Kanghoon (Danny) Seo – [kanghoon.seo@mail.utoronto.ca](mailto:kanghoon.seo@mail.utoronto.ca)

Please only write to the TA for specific issues, such as help with finding a resource they mentioned in tutorial, etc. If you have questions regarding course content, you must post it to the Learning Portal discussion board for the class (see below).



### Course coordinator

Ahmed Elbassiouny – [ahmed.elbassiouny@utoronto.ca](mailto:ahmed.elbassiouny@utoronto.ca) – Room SW421-D

**Office Hours:** Mon./Tue./Wed. 10-11AM (or by appointment)

You should contact Ahmed for the following reasons:

- Questions regarding course prerequisites or exclusion
- Questions regarding exam conflicts
- Questions regarding missing/missed exams (UTSC medical certificates)
- Questions regarding viewing graded exams

### Prerequisites

BIOA01H3, BIOA02H3, CHMA10H3 and CHMA11H3

### Exclusions

(BIOB30H3), BIO270H and BIO204H

### Recommended Prep

MATA29H3

### Lectures

Fridays from 10 AM-12 PM in room SY110 (see course schedule below).

### Tutorials

There will be 4 tutorials on Fridays from 12-1 PM in room SY110 (see course schedule below). The tutorials are not required, but will provide you with extra help for difficult concepts and exams.

### Office hours

Fridays 1-3 PM – Room AC254

I encourage you to come to office hours if you are struggling to understand any course content. I have booked a library room so we can accommodate many people. I have also made it after lecture, so it will be a good forum to ask any questions you may have from the lectures.

**Note:** I will hold extra office hours on Tuesday August 2<sup>nd</sup> and an extended office hours from 10AM-3PM on August 5<sup>th</sup> (in AC254) for help with the final exam (see the schedule below).

### Learning Portal ([portal.utoronto.ca](http://portal.utoronto.ca))

All course materials (lectures, optional readings, handouts and study guides) will be available on the Learning Portal site for the class. Course announcements will also be posted there. Additionally, you must post any questions regarding class content to the Learning Portal site on the discussion board. The TA and I will answer all questions posted there as fast as possible. *We will ignore questions on course material emailed to us.* You should visit the Learning Portal page frequently.

### WebOption

Video recordings of all of the lectures will be made available online via WebOption Lecture Casting, and can be accessed through the Learning Portal site. In general, these can be used as a supplement to the lectures if you can't make it and provide a study aid. I still encourage you to attend lectures, though. **Note: there are 3 lectures this semester that will record in advance and which will only be available via WebOption (see the schedule below).**

### How to ask questions

I will have a strict policy of not answering any questions regarding course content via email, as I want the answers to any such questions to be available for everyone to read. I will spend some time every week reading and answering any questions posted to the discussion board. **I will ignore questions about course content that are emailed to me.** Only email me if you have a personal issue that the TA or the Course Coordinator do not have the authority to resolve.



## COURSE REQUIREMENTS AND EVALUATION

### Reading

The assigned textbook for this class is *Animal Physiology* (3<sup>rd</sup> edition) by Hill, Wyse and Anderson. It is available at the bookstore and the UTSC library. Readings from the text will be assigned for each week. **These readings are required and any content in the required readings is fair game for the exams.** Please read the sections for each week before or soon after the lectures for that week. I have assigned study questions from the textbook (see below). You will not be marked on these and they are not mandatory. But, I encourage you to try to answer them and bring them to Office Hours or Tutorials if you have any trouble with them.

I will also post optional readings on the Learning Portal. These are not mandatory and you will not be tested on their content. But, I encourage you to read them as they will provide additional insights.

### Exams

There will be one midterm exam and a final exam (their dates, times and locations have yet to be determined). Their worth will be worth 40% and 60% of your final mark, respectively. They will be composed of multiple choice and short answer questions. **It is critical that you take both exams.** If you have a valid reason for missing an exam (e.g. sickness) you must contact the course coordinator and make arrangements, see also UTSC's policy on deferred exams:

[http://www.utoronto.ca/~registrar/current\\_students/deferred\\_exams](http://www.utoronto.ca/~registrar/current_students/deferred_exams)

## IMPORTANT DATES

Date	Event
May 6 <sup>th</sup>	First lecture
May 13 <sup>th</sup>	1 <sup>st</sup> Tutorial
May 27 <sup>th</sup>	<u>No class</u> - WebOption only lecture
June 3 <sup>rd</sup>	2 <sup>nd</sup> Tutorial
June 14 <sup>th</sup> –18 <sup>th</sup>	Reading week – no class
July 1 <sup>st</sup>	Canada Day – No lecture
July 8 <sup>th</sup>	3 <sup>rd</sup> Tutorial
July 15 <sup>th</sup>	<u>No class</u> - WebOption only lecture
July 18 <sup>th</sup>	Last day to drop without academic penalty
July 22 <sup>nd</sup>	<u>No class</u> - WebOption only lecture
July 29 <sup>th</sup>	4 <sup>th</sup> Tutorial
August 2 <sup>nd</sup>	Final lecture and extra office hours
August 5 <sup>th</sup>	Extended office hours 10AM-3PM for exam
August 6 <sup>th</sup> -20 <sup>th</sup>	Final exam period

**Note: the dates, times and places for both the midterm exam and the final exam have yet to be determined.** When they are fixed I will make an announcement both in class and on the Learning Portal



## CLASS OUTLINE

### Lecture 1 – May 6<sup>th</sup> – Introduction to animal physiology

#### Part 1

Topic – You are a machine

#### Readings and study questions

- Chapter 1 (p3-10)
- No study questions

*No tutorial*

#### Part 2

Topic – Order and homeostasis

#### Readings and study questions

- Chapter 1 (p11-14, up to Time in the lives of animals section)
- Question 11

### Lecture 2 – May 13<sup>th</sup> – The fundamentals

#### Part 1

Topic – Thermodynamics and life on Earth

#### Readings and study questions

- Chapter 7 (p 161-166, including Box 7.2, up to Metabolic Rate section)
- Questions 2,3,7

#### Part 2

Topic – Protein structure and function

#### Readings and study questions

- Chapter 1 (p 14-16, from Time in the lives of animals, up to Size in the lives of animals)
- Box 2.1 & On-line Extension
- Chapter 4 (p 90-96)
- Questions (Ch. 1) 2, (Ch. 4) 3

**Tutorial** (12-1 PM) – Review session: entropy, equilibrium and homeostasis

### Lecture 3 – May 20<sup>th</sup> – Cellular functions

#### Part 1

Topic – Enzyme function

#### Readings and study questions

- Chapter 2 (p 40-52, up to Evolution of Enzymes)
- Questions 4,6

#### Part 2

Topic – Cell membranes and epithelia

#### Readings and study questions

- Chapter 2 (p 30-42, from Cell Membranes up to Elements of Metabolism, p 58-64 from Reception to end of chapter)
- Questions 5,9

*No tutorial*

### Lecture 4 – May 27<sup>th</sup> – Gradients and movement – No class, WebOption only!

#### Part 1

Topic – Electrochemical gradients

#### Readings and study questions

- Chapter 5 (p99-108, up to Passive Solute Transport by Facilitated Diffusion)
- Questions 1,9

*No tutorial*

#### Part 2

Topic – Osmosis, transporters and channels

#### Readings and study questions

- Chapter 5 (p 108-123)
- Questions 2,4,5,10

Lecture 5 – June 3<sup>rd</sup> – Metabolism and heatPart 1

Topic – Metabolism

## Readings and study questions

- Chapter 7 (p166-181)
- Chapter 8 (p183-194, up to Fatigue and Muscle Fiber Types)
- Questions (Ch. 7) 5,11 (Ch. 8) 3,8

**Tutorial** (12-1 PM) – Review session: electrochemical gradients and energyPart 2

Topic – Thermal relations

## Readings and study questions

- Chapter 10 (p225-268, up to Warm Bodied Fish)
- Questions 1,5,9

Lecture 6 – June 10<sup>th</sup> – Gas exchange and breathingPart 1

Topic – Gas exchange

## Readings and study questions

- Chapter 22
- Questions 3,8,10

*No tutorial*Part 2

Topic – Breathing

## Readings and study questions

- Chapter 23 (p583-594, up to Breathing by Amphibians & p597-608, from Breathing by Mammals up to Breathing by Aquatic Invertebrates)
- Questions 1,5,9

Lecture 7 – June 24<sup>th</sup> – Gas transport and circulationPart 1Topic – O<sub>2</sub> and CO<sub>2</sub> transport

## Readings and study questions

- Chapter 24
- Questions 2,4,9

*No tutorial*Part 2

Topic – Circulatory systems

## Readings and study questions

- Chapter 25 (p647-670, up to Invertebrates with Closed Circulatory Systems)
- Questions 2,4,8

Lecture 8 – July 8<sup>th</sup> – Water, salt and nitrogen regulationPart 1

Topic – Principles of water and salt regulation

## Readings and study questions

- Chapter 27
- Box 28.3
- Questions (Ch. 27) 1,2,8

**Tutorial** (12-1 PM) – Review session: equilibrium in gas, water and salt regulationPart 2

Topic – Kidney function and nitrogen excretion

## Readings and study questions

- Chapter 29, (p753-777 up to Urine Formation in Decapod Crustaceans and p782-785, from Nitrogen Disposition and Excretion)
- Questions 4,5,7

## Lecture 9 – July 15<sup>th</sup> – The nervous system – No class, WebOption only!

### Part 1

Topic – Neurons

Readings and study questions

- Chapter 12 (p295-316 up to There are variations in the ionic mechanisms of excitable cells)
- Questions 1,5,10

*No tutorial*

### Part 2

Topic – Synapses

Readings and study questions

- Chapter 13
- Questions 2,9,10

## Lecture 10 – July 22<sup>nd</sup> – Signalling systems – No class, WebOption only!

### Part 1

Topic – Sensation and perception

Readings and study questions

- Chapter 14 (p359-373 up to Chemoreception and Taste, and p381-395 from Photoreception)
- Questions 6,8,9

*No tutorial*

### Part 2

Topic – Endocrine systems

Readings and study questions

- Chapter 16 (p419-448 up to Insect Metamorphosis)
- Questions 4,7,9

## Lecture 11 – July 29<sup>th</sup> – Movement

### Part 1

Topic – Motor control

Readings and study questions

- Chapter 19
- Questions 2,5

**Tutorial** (12-1 PM) – Review session: membrane potentials and excitable cells

### Part 2

Topic – Muscles

Readings and study questions

- Chapter 20 (p523-539)
- Questions 2,3,4

## Lecture 12 – August 2<sup>nd</sup> – Course summary & review

### Part 1

Topic – Course summary

Readings and study questions

- No new readings

*No tutorial*

### Part 2

Topic – Review and Q&A session

Readings and study questions

- No new readings