

BIOB34H3 – Animal Physiology



Course Syllabus

Fall 2016

Instructor

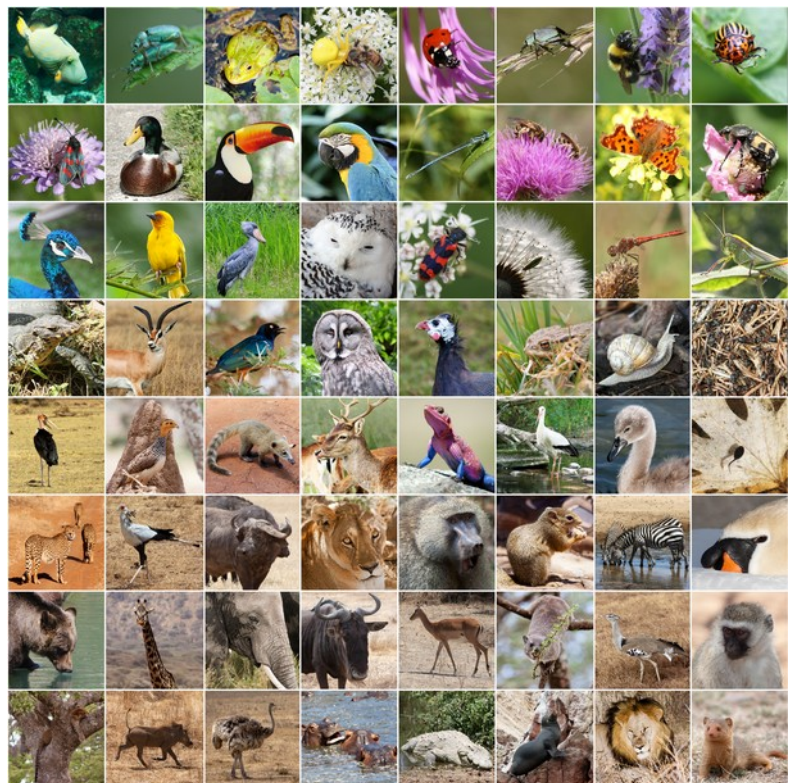
Dr. Blake Aaron Richards – blake.richards@utoronto.ca – Room SW525

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.

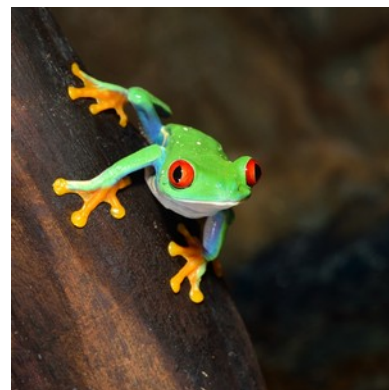
GENERAL COURSE INFORMATION

Teaching assistant

Michael Martin – michaelpr.martin@mail.utoronto.ca

Kirthana Sathiyakumar – sankirthana.sathiyakumar@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

Irene Wandili – irene.wandili@utoronto.ca – Room SW421-D

Office Hours: Mon.-Wed. 10 AM-12 PM (or by appointment)

You should contact Irene 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

Tuesdays and Thursdays from 9-10 AM in room AC223 (see course schedule below).

Tutorials

There will be 2 tutorials on Thursday from 5-7 PM in room AC223 (see course schedule below). The tutorials are not required, but will provide you with extra help for difficult concepts and the final.

Office hours

Thursdays 10 AM-12 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.

Learning Portal (portal.utoronto.ca)

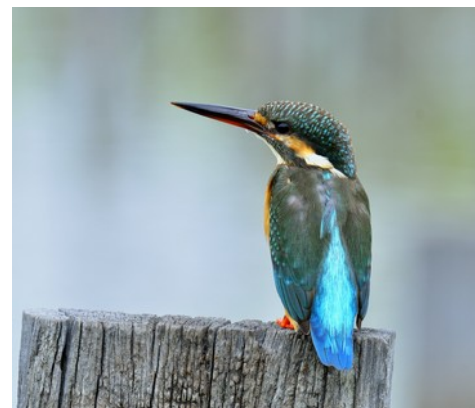
All course materials (lectures, optional readings, handouts and study guides) will be available on the Learning Portal site for the class. Course announcements will also be posted there. Additionally, you must post any questions regarding class content to the Learning Portal site on the discussion board. 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.

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* (4th edition) by Hill, Wyse and Anderson. It is available at the bookstore and the UTSC library. **Note: the 3rd edition is also fine.** 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 may 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.utsc.utoronto.ca/~registrar/current_students/deferred_exams

IMPORTANT DATES

Date	Event
September 6 th	First lecture
September 15 th	1 st Tutorial
October 10 th –14 th	Reading week – no class
November 10 th	2 nd Tutorial
December 1 st	Final lecture (review session)
December 5 th –20 th	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

Week 1 – Introduction to animal physiology

September 6th

Topic – You are a machine

Readings and study questions

- Chapter 1 (up to This Book's Approach to Physiology)
- No study questions

No tutorial

September 8th

Topic – Order and homeostasis

Readings and study questions

- Chapter 1 (up to Time in the lives of animals)
- Question 11

Week 2 – The fundamentals

September 13th

Topic – Thermodynamics and life on Earth

Readings and study questions

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

No tutorial

September 15th

Topic – Protein structure and function

Readings and study questions

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

Tutorial (5-7 PM) – Understanding entropy, equilibrium and homeostasis

Week 3 – Cellular functions

September 20th

Topic – Enzyme function

Readings and study questions

- Chapter 2 (from Elements of Metabolism up to Evolution of Enzymes)
- Questions 4,6

No tutorial

September 22nd

Topic – Cell membranes and epithelia

Readings and study questions

- Chapter 2 (up to Elements of Metabolism, plus from Reception and Use of Signals to end of chapter)
- Questions 5,9

Week 4 – Gradients and movement

September 27th

Topic – Electrochemical gradients

Readings and study questions

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

No tutorial

September 29th

Topic – Osmosis, transporters and channels

Readings and study questions

- Chapter 5 (from Passive Solute Transport by Facilitated Diffusion to end of chapter)
- Questions 2,4,5,10

Week 5 – Metabolism and heat

October 4th

Topic – Metabolism

Readings and study questions

- Chapter 7 (from Metabolic Rate: Meaning and Measurement to end of chapter)
- Chapter 8 (up to Two Themes in Exercise Physiology: Fatigue and Muscle Fiber Types)
- Questions (Ch. 7) 5,11 (Ch. 8) 3,8

No tutorial

October 6th

Topic – Thermal relations

Readings and study questions

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

Week 6 – Gas exchange and breathing

October 18th

Topic – Gas exchange

Readings and study questions

- Chapter 22
- Questions 3,8,10

No tutorial

October 20th

Topic – Breathing

Readings and study questions

- Chapter 23 (up to Breathing by Amphibians, plus from Breathing by Mammals up to Breathing by Aquatic Invertebrates)
- Questions 1,5,9

Week 7 – Gas transport and circulation

October 25th

Topic – O₂ and CO₂ transport

Readings and study questions

- Chapter 24
- Questions 2,4,9

No tutorial

October 27th

Topic – Circulatory systems

Readings and study questions

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

Week 8 – Water, salt and nitrogen regulation

November 1st

Topic – Principles of water and salt regulation

Readings and study questions

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

No tutorial

November 3rd

Topic – Kidney function and nitrogen excretion

Readings and study questions

- Chapter 29, (up to Urine Formation in Other Vertebrates, plus from Nitrogen Disposition and Excretion to end of chapter)
- Questions 4,5,9

Week 9 – The nervous system

November 8th

Topic – Neurons

Readings and study questions

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

No tutorial

November 10th

Topic – Synapses

Readings and study questions

- Chapter 13
- Questions 2,9,10

Tutorial (5-7 PM) – Using the Nernst and Goldman equations to analyze neurons

Week 10 – Signalling systems

November 15th

Topic – Sensation and perception

Readings and study questions

- Chapter 14 (up to Chemoreception and Taste, plus from Photoreception to end of chapter)
- Questions 6,8,9

No tutorial

November 17th

Topic – Endocrine systems

Readings and study questions

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

Week 11 – Movement

November 22nd

Topic – Motor control

Readings and study questions

- Chapter 19
- Questions 2,5

No tutorial

November 24th

Topic – Muscles

Readings and study questions

- Chapter 20 (up to Neuronal Control of Skeletal Muscle)
- Questions 2,3,4

Week 12 – Course summary & review

November 29th

Topic – Course summary

Readings and study questions

- No new readings

No tutorial

December 1st

Topic – Review and Q&A session

Readings and study questions

- No new readings