DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Biology
BIOL 3079 and MARI 3076
Animal Physiology and Marine Animal Physiology, Part II
Winter, 2022

Lecturer: Dr. Margi Cooper, mhcooper@dal.ca
Lab Instructor: Nina Hamacher, nhamacher@dal.ca; LSC 7026

Lectures: The lecture portion of this course will be delivered using a combination of asynchronous and synchronous components. The synchronous component is the scheduled lecture times of 9:35-10:25am Mondays and Wednesdays. *Because we are starting the term online, our synchronous lectures will take place via Collaborate within our Brightspace site until we are allowed to meet in-person.* The online synchronous lectures will be recorded and posted on Brightspace. Whenever we can meet in-person, lectures will be held in LSC C238. The asynchronous component involves a small number of lecture videos that you will need to watch, and make notes on, before attending each Monday lecture. These lecture videos will be a part of the course regardless of whether synchronous lectures take place via Collaborate or in-person.

Laboratories: Lab 1 will be online and can be completed asynchronously. Please allow 5-6 hours for completion of this lab and its associated assignments. The lab instructor and/or DM's will be available on Collaborate during the following hours to provide instruction and answer questions:

BIOL 3079:
Tuesday, Jan. 18th from 2:30-4:30 pm.

MARI 3076:
Wednesday, Jan. 19th from 2:30-4:30 pm.
Thursday, Jan. 20th from 2:30-4:30 pm.

Unless university policies change, all subsequent labs will be held in person in LSC room 7009 at the scheduled time and days. For more detail, please refer to the laboratory schedule.

Course Description

This course is a continuation of a discussion of the mechanisms which coordinate the activities of cells within multicellular organisms which began in BIOL 3078.03/MARI 3074.03. This term emphasizes the urinary, cardiovascular, and respiratory systems. The laboratories reflect the approaches taken to study these systems in a variety of organisms.

PREREQUISITES: BIOL 3078.03 or MARI 3074.03
EXCLUSIONS: BIOA 3005.03

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Learning Outcomes

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

- Describe the potential fates of energy ingested by animals.
- Define metabolic rate and describe methods used for its measurement.
- Identify factors affecting an animal's metabolic rate and explain in detail the effects of ingesting a meal, body size, and physical activity on metabolic rate.
- Identify aerobic and anaerobic mechanisms of ATP production, detail their functional properties and relate those to when animals employ each mechanism.
- Relate energy costs of locomotion to speed, and body size for various modes of locomotion.
- Relate an animal's maximum rate of oxygen consumption to parameters affecting fitness as well as strenuousness of exercise.
- Relate the diffusion of oxygen and carbon dioxide in air and aqueous solutions to the respiratory physiology of air breathing and water breathing animals.
- Describe the importance of the relationship between the flow of blood and the flow of respiratory fluid in breathing organs, comparing the effectiveness of various arrangements.
- Calculate and compare the ventilatory requirements of air breathers and water breathers.
- Describe the anatomy and physiology of breathing in a variety of animal groups.
- Describe the role of respiratory pigments and how their structure affects the shape of oxygen equilibrium curves.
- Interpret oxygen equilibrium curves in terms of oxygen affinity and oxygen carrying capacity; describe factors that affect both these characteristics.
- Describe the various ways in which carbon dioxide is transported in the blood of animals.
- Describe the structure of cardiac muscle, and relate the electrical and molecular events of cardiac action potentials.
- Describe the mechanical and electrical events of the cardiac cycle.
- Relate pressure, resistance, and flow within vascular systems.
- Describe the anatomy and physiology of circulation in a variety of animal groups.
- Describe physiological adaptations underlying the diving abilities of marine mammals.
- Describe the compartmentalization and composition of body fluid in animals.
- Explain how osmotic, ionic, and volume regulation are achieved in freshwater, marine, and terrestrial animals.
- Collect qualitative and quantitative data and interpret the experimental results
- Practice written communication skills
- Critically analyze/interpret data from lab simulations or scientific journal papers
- Conduct literature and online searches of primary and secondary sources using electronic databases and online search tools

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Course Materials

Hill, R., G. Wyse and M. Anderson. *Animal Physiology.* Fourth edition. 2016.

You will be able to access the e- textbook inside of Brightspace. All you need to do is click on the link to the e-textbook. You can access your course material for free any time before the add-drop deadline. If you have any questions, please feel free to reach out to support@willolabs.com.

Knisely, K. *A Student Handbook for Writing in Biology.* Fourth edition. 2004.
Alternatively, you can use for free Dalhousie's library information on scientific writing found at Resources for Scientific Writing

Course Assessment

Lecture portion 60%:
Exam 1 – 20%
Exam 2 – 20%
Exam 3 – 20%

All exams are planned to be in-person, but online may be necessary. Exam 1 and 2 will take place during lecture time (see lecture schedule). Exam 3 will be scheduled during the April exam period.

Laboratory portion 40%:
There are 5 labs with assignments (65%) and a final lab exam (35%) that will be scheduled at the same time as lecture Exam 3, during the April exam period.

Laboratory assignments and evaluation information are found in the laboratory folder on Brightspace.

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	**B+** (77-79)	**C+** (65-69)	**D** (50-54)
A (85-89)	**B** (73-76)	**C** (60-64)	**F** (<50)
A- (80-84)	**B-** (70-72)	**C-** (55-59)	

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Course Policies

With continuing uncertainty around course delivery this term, we recognize that open communication will be essential for a positive experience for all of us. We will be communicating with you regularly, and hope that you will feel comfortable asking for help when you need it.

To avoid any misunderstanding or confusion during the term, please note the following policies. These regulations have been put in place to try to ensure fair and equal treatment for all. Extenuating circumstances can arise, however, so please feel free to talk to us if you have problems with any of these regulations at any time during the term.

Missed or Late Academic Requirements due to Student Absence

Please inform us in advance if you are unable to attend any of the exams. They will normally only be rescheduled for illness, and we will require a Self Declaration of Absence (SDA) form. Make up exams will be given **within one week** of the scheduled exam date at a mutually convenient time. **PLEASE NOTE**: We are **NOT** obligated to provide you with a makeup exam, so excuses other than illness or extreme circumstance are unlikely to be considered. The weight of missed exams will not be redistributed across other exams.

SDA forms can be used if you cannot attend any of the lab sections for a particular lab. Without submission of an SDA form, there is a penalty of 2% from the total course grade for missed lab attendance.

SDA forms **cannot** be used to gain extensions on lab assignments. Late laboratory assignments will only be marked in unusual circumstances with the permission of the Lab Instructor, and a penalty of **10% per day** will be deducted. Anything more than 5 days late will not be accepted.

Only TWO SDA forms may be used, in any combination of lectures and laboratories, throughout the term.

Plagiarism and Academic Integrity:

You are expected to abide by Dalhousie University's policies on academic integrity.

We encourage you to work with classmates to help each other learn the content of the class. The Discussion boards will be particularly important for asking questions and receiving help.

However, all assignments that you submit must be independent and entirely your own wording. You can work together to understand content, but assignments must be your own work. This class subscribes to a Brightspace Learning web-based service that checks for originality in submitted work. This service will be used for all assignments and any online exams submitted.

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If at any point exams cannot take place in a proctored setting this year, remember that they are independent assessments. You may consult your notes, textbook, or other course content, but you cannot collaborate with classmates or post questions to external websites. By accessing an exam, you are promising that the work submitted is solely of your own efforts.

The contents of the assessments in the course are the property of BIOL 3079/MARI 3076 and are confidential. You may not share the contents of these assessments on 'homework sharing' websites, (e.g. Chegg, Course Hero, Studocu, etc.)

Copyright Notice:

All course materials are designed for use as part of BIOL 3079/MARI 3076 at Dalhousie University and are the property of the course instructors. This includes all images, videos, documents, assignments and exams. These documents are solely for your learning and evaluation in BIOL 3079/MARI 3076. It is an academic offence to share these materials outside of this course space in such a way that others might gain an unfair advantage, and students who do so may be subject to University discipline. Copying this material for distribution may also lead to a violation of Copyright law.

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Lecture schedule

Date		Videos to Watch Before Attending	Synchronous Lectures
Jan	5		Introduction to (Marine) Animal Physiology II
	10	"Animal Energetics" and "Measuring Metabolic Rate"	Review and Application Questions (AQ)
	12		Metabolic Rate
	17	"Aerobic and Anaerobic Forms of Metabolism"	AQ and Energy Costs of Locomotion
	19		AQ and Maximum Rate of Oxygen Consumption
	24	"Oxygen and Carbon Dioxide Physiology"	AQ and External Respiration
	26		External Respiration cont.
	31		Exam Review
Feb	**2**		**Exam 1 - Animal Energetics through External Respiration**
	7		Breathing in Fish and Aquatic Invertebrates
	9		Breathing in Terrestrial Animals
	14	"Respiratory Pigments" and "Oxygen Equilibrium Curves"	Oxygen Affinity and Carrying Capacity, and Carbon Dioxide Transport and Acid-Base Physiology
	16		AQ and Circulatory Systems and Cardiac Muscle & Action Potentials
	21-25		Reading Week
	28	"Mammalian and Avian Hearts - Anatomy"	Mammalian and Avian Hearts - Cardiac Cycle, Electrical Activity of Hearts, and Cardiac Output
Mar	2		Principles of pressure, resistance, and flow in vascular systems
	7		Exam Review
	9		**Exam 2 - Breathing in… through Cardiac Output**
	14		AQ and Circulation in Mammals and Birds
	16		Circulation in Fish, Amphibians, and Non-Avian Reptiles
	21	"Circulation in Invertebrates"	Diving Physiology in Marine Mammals
	23		Water and Salt Physiology: Intro
	28		Ionic and Osmotic Adaptations - Aquatic Habitats
	30		AQ and Water Conservation in Terrestrial Animals
Apr	4		Exam Review

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Laboratory schedule

Date	Lab #	Description
Jan 17 - 21	1	Exercise and Respiration - *Online*
Jan 24 - 28		No lab – data analysis and report writing
Jan 31 - Feb 4	2	Neurogenic and Myogenic hearts
Feb 7 - 11		No lab – data analysis and report writing
Feb 14 - 18	3	Blood and heart function
Feb 21 - 25		No lab - reading week
Feb 28 - Mar 4		No lab – data analysis and report writing
Mar 7 - 11	4	Diving Physiology
Mar 14 -18		No lab – data analysis and report writing
Mar 21 - 25	5	Osmotic regulation in crabs
Mar 28 – Apr 1		No lab – data analysis and report writing
Finals period		Final Lab Exam

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Faculty of Science Course Syllabus (Section B) (revised June-2021)

Fall/Winter 2021-22

Please ensure that the following information on University Policies is available to all students in your course. This document should be sent to students in your course along with your Course Syllabus, Section A, or may be copied into your **Course Syllabus (Section A).**

University Policies and Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.

Information: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

Information: https://www.dal.ca/campus_life/academic-support/accessibility.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.

Code: https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness

Statement: http://www.dal.ca/cultureofrespect.html

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit or e-mail the Indigenous Student Centre (1321 Edward St) (elders@dal.ca).

Information: https://www.dal.ca/campus_life/communities/indigenous.html

Important Dates in the Academic Year (including add/drop dates)

https://www.dal.ca/academics/important_dates.html

University Grading Practices

https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html

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Faculty of Science Course Syllabus (Section C) (revised June-2021)

Fall/Winter 2021-22

Please ensure that the following information on Student Resources is available to all students in your course. This document should be made available to students on the course Brightspace page, or elements may be copied into your **Course Syllabus.**

Student Resources and Support

Advising

General Advising https://www.dal.ca/campus_life/academic-support/advising.html

Science Program Advisors: https://www.dal.ca/faculty/science/current-students/academic-advising.html

Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html

Black Students Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html

International Centre: https://www.dal.ca/campus_life/international-centre/current-students.html

Academic supports

Library: https://libraries.dal.ca/

Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html

Studying for Success: https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html

Copyright Office: https://libraries.dal.ca/services/copyright-office.html

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/fair-dealing.html

Other supports and services

Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html

Student Advocacy: https://dsu.ca/dsas

Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html

Safety

Biosafety: https://www.dal.ca/dept/safety/programs-services/biosafety.html

Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html

Radiation Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety.html

Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Dalhousie COVID-19 information and updates: https://www.dal.ca/covid-19-information-and-updates.html