

**Faculty of Science and Faculty of Graduate Studies Course Syllabus
Department of Biology**

MARI 3602.03 — BIOL 5602.03
Introduction to Aquaculture
Fall 2019

Instructor: Dr. Diego Ibarra | *e-mail:* Diego.Ibarra@dal.ca | *Office:* LSC-3625 (Oceanography)

Office hours: by appointment

Lectures: Tue, Thu - 4:05 pm to 5:25 pm | *Location:* Studley LSC-COMMON AREA C236

TA: Jessica Bennett | *email:* js344308@dal.ca

Course Description

This course offers a lecture-based introductory overview of aquaculture; the culturing and rearing of aquatic plants and animals. Lectures will deal with the following topics: (1) general overview of aquaculture; (2) physical and chemical properties of the aquatic environment; (3) site selection; (4) aquatic engineering; (5) aquaculture modeling; (6) finfish culture; (7) bivalve culture; (8) crustacean culture; (9) seaweed culture; (10) health and pathology; (11) growth and nutrition; (12) genetics and reproduction; (13) legal, economic, social and environmental considerations; (14) sustainability issues. These topics will be covered with both a Maritimes and a global perspective.

This course is designed to familiarize students with the multi-disciplinary nature of aquaculture as a field. The introduction will describe the state of aquaculture production in the world. The main body of the course is divided in three sections covering the aquatic milieu, species specific culture techniques, and general biological principles. The amount of interplay between various physical, biological and species-specific aspects will be shown in each topic. We will overview legal, economic and social considerations and we will look at some of the controversies surrounding aquaculture environmental sustainability. This is an introductory class, and most topics will not be covered in fine detail. However, I expect student to get a clear appreciation of the underlying principles of aquaculture and how these come into play in chosen examples of aquaculture practices.

Course Prerequisites

Undergraduate	Graduate
BIOL 2003.03 – Animal Diversity OR Instructor's approval	Instructor's approval

Course Objectives/Learning Outcomes

- Describe the historical and current state of aquaculture in the world
- Describe the basic physical-chemical parameters of water that are relevant to aquaculture
- Explain current culture systems and associated basic engineering aspects
- Characterize the biology and culture of 8 major groups of cultured aquatic organisms
- Explain basic reproductive physiology and the application of genetic tools to aquaculture
- Identify the important macro and micronutrients relevant to fish nutrition and feed formulation
- States the main factors related to aquatic health and disease and their interplay
- Describe the main economic, legal and social contexts associated with aquaculture
- Discuss the various point of views related to aquaculture environmental impacts and sustainability
- Extract information from relevant aquaculture-related sources for presentation (Class presentation)

Course Materials

Textbook (optional):

- Aquaculture. Farming Aquatic Animals and Plants. 2nd edition 2012. J. Lucas and P. Southgate (Editors), 629 pp.
OR
- Aquaculture. Farming Aquatic Animals and Plants. 2003, J. Lucas and P. Southgate (Editors), 502 pp.

Class notes:

Class notes are posted on Brightspace. Announcements and additional material will be posted regularly and students should check the site frequently.

Other useful reading material:

Encyclopedia of Aquaculture. (2000). R. Stickney (Editor) *This is an excellent and relatively up-to-date source of information.	SH 20.3 E53
Principles of Aquaculture. R Stickney	SH 135 S74 1994
Introduction to aquaculture. M. Landau	SH 135 L36 1992
Ecological Aquaculture. The evolution of the blue revolution B. Costa-Pierce	SH 135 E35 2002
Cold-water aquaculture in Atlantic Canada A. Boghen	SH 37 C64 1995

Course Assessment

Component	Weight (% of final grade)		Date
	Undergraduate	Graduate	
Daily Quizzes	50	35	Every lecture
Midterm exam	25	15	Tue, Oct-15
Mini Final exam	25	20	Thu, Nov-28
Research paper	-	30	One week after final exam @ 11:59 pm
TOTAL	/100	/100	

Daily Quizzes

At the beginning of most lectures, a written quiz (approx. 10 minutes) will be applied to test the material taught during the previous lecture (plus one question from previous quizzes). Students are **required** to bring and use a **hand-written “cheat-sheet”** for each Daily Quiz. Cheat-sheets not meeting specifications (see below) will result in a zero grade in the corresponding quiz. Note that appropriate documentation is required to justify missed quizzes (see in: Course Policies > Missing a class).

Cheat-sheet specifications:

- Cheat-sheets are personal. **Copying somebody else’s cheat-sheet is a serious plagiarism offence** requiring the instructor to report all involved parties to the Academic Integrity Office.
- Cheat-sheets **MUST** be hand-written on paper. Digitization, electronic manipulation, photocopying, photographing and/or printing of cheat-sheets is not allowed.
- Size: each cheat-sheet is limited to one side of a letter-sized sheet of paper.
- Content: Anything you want, but **must** demonstrate effort to synthesize lecture content.

Midterm exam

Unlike Daily Quizzes, it is **NOT** allowed to bring a cheat-sheet to the midterm exam.

Mini Final exam

Unlike Daily Quizzes, it is **NOT** allowed to bring a cheat-sheet to the mini final exam.

Research paper (Graduate students only)

Each graduate student needs to prepare a *Literature Review* “manuscript” following the “Review Articles” guidelines in the “[Guide for Authors](#)” from the journal *Aquaculture*. The manuscript must provide objective critical evaluation of the subject. It cannot consist solely of a summary of the available literature. Evaluation of the quality of existing data, the status of knowledge, and the research required to advance knowledge of the subject are essential.

Students are encouraged to discuss their interests and propose subject ideas to the instructor. However, the subject of the review will ultimately be appointed by the instructor. If the student is registered for the *Graduate Certificate in Aquaculture*, the subject of the review must also be approved by the Certificate Coordinator.

Rubric: Research paper

Component		Comments	Weight (%)
Format		Manuscript must follow the formatting guidelines from the “Guide for Authors – Type of paper: Review Articles” from the journal Aquaculture https://www.elsevier.com/journals/aquaculture/0044-8486/guide-for-authors	5%
Clarity		Writing style must be clear and concise. The main content must be divided using headings carefully chosen to assist the reader to understand the content	10%
Critical thinking		The manuscript cannot be a simple summary of literature. Students must demonstrate the ability to evaluate the quality of the available knowledge and to provide suggestions for further advance the subject	10%
Content	Title	Follow instructions in “Guide for Authors – Type of paper: Review Articles” from the journal Aquaculture. https://www.elsevier.com/journals/aquaculture/0044-8486/guide-for-authors	5%
	Abstract		10%
	Table of contents		5%
	Introduction		5%
	Content sections		30%
	Conclusions		10%
	References		10%
TOTAL:			100%

Conversion of numerical grades to Final Letter Grades

Undergraduate students follow the Dalhousie Common Grade Scale. Graduate students follow a stricter scale, where a minimum of 70% (B-) is required to pass.

%	Undergraduate			Graduate		
	Letter Grade	Grade Point Value	Definition	Letter Grade	Grade Point Value	Definition
90 - 100	A+	4.30	Exceptional	A+	4.30	Exceptional
85-89	A	4.00	Excellent	A	4.00	Excellent
80-84	A-	3.70	Very Good	A-	3.70	Very Good
77-79	B+	3.30	Good	B+	3.30	Good
73-76	B	3.00		B	3.00	
70-72	B-	2.70		B-	2.70	
65-69	C+	2.30	Satisfactory	F	0.00	Failure
60-64	C	2.00		F		
55-59	C-	1.70		F		
50-54	D	1.00		F		
<50	F	0.00	Failure	F		

Course Policies

Attendance is mandatory: Students are required to attend to all classes, and to remain in class for its entire duration.

Missing a class:

- Email **both**, the TA and the Instructor, briefly explaining your circumstance and dates.
- You also need to fill in a [Student Declaration of Absence \(SDA\) form](#) and upload it to the Brightspace Dropbox designated for SDAs.
- Students with an Accessibility or Accommodation Plan in place **do not** need to submit SDA form.

Brightspace will be used to post lectures, updates and announcements.

Course Content

Week	Day	Date	Topic
1	Tue	Sep-3	Syllabus and course presentation Background
1	Thu	Sep-5	History Production and trends
2	Tue	Sep-10	Physicochemistry of water
2	Thu	Sep-12	Physicochemistry of sediments
3	Tue	Sep-17	Sources of water Culture systems 1
3	Thu	Sep-19	Culture systems 2
4	Tue	Sep-24	Microalgae (biofuels) and other live feed Macroalgae
4	Thu	Sep-26	Bivalves and other mollusks
5	Tue	Oct-1	Shrimps and other crustaceans
5	Thu	Oct-3	Freshwater finfish (carp and tilapia)
6	Tue	Oct-8	Salmonids
6	Thu	Oct-10	Marine finfish
7	Tue	Oct-15	MIDTERM
7	Thu	Oct-17	Aquaculture engineering 1
8	Tue	Oct-22	Aquaculture engineering 2
8	Thu	Oct-24	Aquaculture modelling
9	Tue	Oct-29	Genetics and reproduction
9	Thu	Oct-31	Nutrition
10	Tue	Nov-5	Diseases
10	Thu	Nov-7	Sustainability and controversies
11	Tue	Nov-12	FALL STUDY BREAK
11	Thu	Nov-14	FALL STUDY BREAK
12	Tue	Nov-19	Economics and business planning in aquaculture
12	Thu	Nov-21	Aquaculture legislation and regulations in Nova Scotia and Canada
13	Tue	Nov-26	Course review, exam preparation and Student Rating of Instruction (SRI)
13	Thu	Nov-28	MINI FINAL

NOTE: Lecture dates and topics may change depending on course pace and weather-related class cancellations.

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

Missed or Late Academic Requirements due to Student Absence (policy)

https://www.dal.ca/dept/university_secretariat/policies/academic/missed-or-late-academic-requirements-due-to-student-absence.html

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>