



ZOO*4570 Marine Ecological Processes

Winter 2020

Section(s): C01

Department of Integrative Biology

Credit Weight: 0.50

Version 1.00 - November 21, 2019

1 Course Details

1.1 Calendar Description

This course provides an advanced analysis of the physical and biogeochemical processes in the world's oceans and the dependence of biological processes on physical and chemical processes from micro- to macro-scales. Topics to be discussed include production and energy transfer within pelagic food webs, export of energy to the benthos, and structure and dynamics of marine communities.

Pre-Requisites: BIOL*2060, BIOL*3450, PHYS*1080

1.2 Timetable

- Lectures: Monday, Wednesday, and Friday 10:30AM - 11:20AM in McKinnon 117
- Laboratory: Friday 12:30PM - 01:20PM in SSC 2314

1.3 Final Exam

Date and Room TBA

Exam time and location is subject to change. Please see WebAdvisor for the latest information.

2 Instructional Support

2.1 Instructional Support Team

Instructor: Josef Ackerman
Email: ackerman@uoguelph.ca

Telephone: +1-519-824-4120 x58268
Office: SC1 2468
Office Hours: Thursday/Friday 1:30-2:30; or via appointment by email

3 Learning Resources

3.1 Required Resources

Notes (Notes)

- CourseLink: Please check the course D2L site under:
"Content": postings of pdfs of selected (the more detailed) lecture slides, details of wet and computer laboratory assignments, Practice midterm and final exam questions.

Readings in marine Ecological Processes (Textbook)

- CourseLink: Please check the course D2L site under:
"Required Textbooks": "Readings in marine Ecological Processes 2017 (ZOO*4570). ISBN-13: 978-0-17-6774257 (Nelson).

Courselink (Website)

<https://courselink.uoguelph.ca>

- This course will make use of the University of Guelph's course website on D2L (via Courselink). You are responsible for all information posted on the Courselink page for BIOL*4350.
- Links to additional required readings will be posted on CourseLink.
- PDFs of Lecture Presentations will be posted on Courselink prior to each lecture. Please check for any revisions to the PDF files (indicated by "-R.pdf), which may be posted after the lecture.

3.2 Recommended Resources

Discussions (Notes)

- CourseLink: Please check the course D2L site under:
"Discussions": student-lead postings about current topics in marine ecology

Lecture Material Sources (Readings)

- CourseLink: Please check the course D2L site under:
Lecture Material Sources (most available on 4 hour reserve in
McLaughlin Library):
1. Lalli,C.M. and T.R. Parsons. 1997. Biological Oceanography: an Introduction. 2nd Edition. Open University Set Book, 314 pages, ~ \$73, Butterworth-Heinemann /Elsevier, ISBN: 0-7506-3384-0
 2. Open University. 2001. Ocean circulation. 2nd edition. Butterworth-Heinemann of Elsevier. 286 pages, ~\$50, ISBN: 0-7506-5278-0
 3. Open University. 2005. Marine Biogeochemistry. (formerly Ocean chemistry and deep sea sediments), Butterworth-Heinemann of Elsevier. ~\$68 ISBN:0-7506-6793-1
 4. Mann,K,H.and J.R.N. Lazier 2005. Blackwell. Dynamics of marine ecosystems: Biological-Physical Interactions in the Oceans. 3rd edition, . ~ \$87.
 5. Open University. 1995.Seawater: its composition properties and behaviour. 2nd ed., Butterworth-Heinemann of Elsevier. 166 pages. ~ \$55, ISBN: 0-7506-3715-3
 6. Open University. 2000. Waves, Tides and Shallow water processes. 2nd ed. Butterworth-Heinemann of Elsevier 227 pages. ~ \$47, ISBN: 0750642815.
 7. Valiela, I. 1995. Marine Ecological Processes. 2nd ed., Springer-Verlag, 686 pages. ~ \$72, ISBN: 0-387-94321-8
 8. Trujillo and Thurman. 2005. Essentials of Oceanography. 8th ed. Pearson, Prentice Hall. 532 pages, ISBN: 0-13-144773-4
 9. Thurman and Trujillo. 2004. Introductory Oceanography. 10th ed. Pearson, Prentice Hall. 608 pages,~ \$120, ISBN: 0-13-143888-3
 10. Marine Biology: Function, Biodiversity, Ecology with CD-ROM Second Edition Jeffrey S. Levinton 2007 Oxford Press ISBN13: 9780195141726
 11. Laboratory Exercises in Oceanography 4th edition by Bernard W Pipkin et al. Paperback: 272 pages, Publisher: Worth Publishers; 4th edition (2011) ISBN-10: 0716794926, ISBN-13: 978-0716794929.

4 Learning Outcomes

The course goal is to integrate introductory Marine Geology, Marine Chemistry, Marine

Physics, Marine Biology and Marine Ecosystem Processes with the existing Zoology background of Marine and Freshwater Biology majors.

4.1 Course Learning Outcomes

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

1.
 - Topic: Ocean geology
 - Expectations (input), students entering this class should be able to describe: Factors affecting species distribution and abundance
 - Learning Outcomes (output), students successfully finishing this class should be able to: Describe how plate tectonics affects the distribution of vent fauna

2.
 - Topic: Ocean geography
 - Expectations (input), students entering this class should be able to describe: The major oceans and continents
 - Learning Outcomes (output), students successfully finishing this class should be able to: Explain spatial and depth variation in composition of ocean sediments

3.
 - Topic: Water movements
 - Expectations (input), students entering this class should be able to describe: Major ocean currents
 - Learning Outcomes (output), students successfully finishing this class should be able to: Understand factors affecting ocean basin circulation

4.
 - Topic: Ocean stratification
 - Expectations (input), students entering this class should be able to describe: Seasonal thermal stratification in lakes and perhaps oceans
 - Learning Outcomes (output), students successfully finishing this class should be able to: Explain seasonal nutrient availability in euphotic zone

5.
 - Topic: Convergence/Divergence
 - Expectations (input), students entering this class should be able to describe: Seasonal nutrient regeneration in lakes and perhaps oceans
 - Learning Outcomes (output), students successfully finishing this class

should be able to: Predict where major upwelling/downwelling regions are located

6.
 - Topic: Seawater Composition
 - Expectations (input), students entering this class should be able to describe: Freezing point depression, boiling point elevation with increasing salinity
 - Learning Outcomes (output), students successfully finishing this class should be able to: Understand constancy of composition of seawater and how halocline density gradients form

7.
 - Topic: Nutrient limitation
 - Expectations (input), students entering this class should be able to describe: Nitrogen and phosphorous cycles
 - Learning Outcomes (output), students successfully finishing this class should be able to: Use Redfield ratio to predict which nutrient is limiting

8.
 - Topic: Primary production
 - Expectations (input), students entering this class should be able to describe: Understand reactions involved in photosynthesis
 - Learning Outcomes (output), students successfully finishing this class should be able to: Predict factors which limit primary production in a particular environment

9.
 - Topic: Phytoplankton diversity
 - Expectations (input), students entering this class should be able to describe: Secondary pigments and metabolites in plants
 - Learning Outcomes (output), students successfully finishing this class should be able to: Understand how the absorption spectrum of a water mass affects critical depth & how armour and chemical warfare affect herbivory

10.
 - Topic: Zooplankton diversity
 - Expectations (input), students entering this class should be able to

describe: Life at low Reynolds numbers

- Learning Outcomes (output), students successfully finishing this class should be able to: Understand feeding mechanisms of small copepods
11.
 - Topic: Predator-prey
 - Expectations (input), students entering this class should be able to describe: Functional responses to prey density
 - Learning Outcomes (output), students successfully finishing this class should be able to: Describe feeding efficiency changes with relative predator-prey size
 12.
 - Topic: Pelagic ecosystems
 - Expectations (input), students entering this class should be able to describe: Food chains and food webs
 - Learning Outcomes (output), students successfully finishing this class should be able to: Understand how food chain length affects fish production
 13.
 - Topic: Oceanographic Processes
 - Expectations (input), students entering this class should be able to describe: Population and Community Ecology
 - Learning Outcomes (output), students successfully finishing this class should be able to: Describe the effects of ocean circulation on community structure
 14.
 - Topic: Coastal Processes
 - Expectations (input), students entering this class should be able to describe: Plate tectonics
 - Learning Outcomes (output), students successfully finishing this class should be able to: Understand the relationship between tectonics and coasts/estuaries
 15.
 - Topic: Tides and Wave
 - Expectations (input), students entering this class should be able to

- describe: Tides and waves
- Learning Outcomes (output), students successfully finishing this class should be able to: Understand how tides and waves affect abiotic and biotic processes
16. • Topic: Benthic ecosystems
- Expectations (input), students entering this class should be able to describe: Larval forms of marine invertebrates and fishes
 - Learning Outcomes (output), students successfully finishing this class should be able to: Predict when benthic-pelagic coupling is important
17. • Topic: Marine communities
- Expectations (input), students entering this class should be able to describe: Disturbance, species diversity and succession
 - Learning Outcomes (output), students successfully finishing this class should be able to: Describe factors affecting zonation and succession
18. • Topic: Ecosystem engineers
- Expectations (input), students entering this class should be able to describe: Global distribution of Coral reefs, seagrass beds, mangroves, and kelp forests
 - Learning Outcomes (output), students successfully finishing this class should be able to: Predict changes in species richness when ecosystem engineers are added to or removed from a section of coastline
19. • Topic: Reproductive Systems
- Expectations (input), students entering this class should be able to describe: Algal and plant reproduction, Larvae of marine invertebrates
 - Learning Outcomes (output), students successfully finishing this class should be able to: Understand reproductive strategies and tradeoffs in benthic ecosystems
20. • Topic: Feeding Ecology
- Expectations (input), students entering this class should be able to

describe: Invertebrate diversity and function

- Learning Outcomes (output), students successfully finishing this class should be able to: Understand the role of abiotic and biotic factors in suspension feeders

5 Teaching and Learning Activities

5.1 Course Content & Readings

Week	Topic	Lecture Topics	Lab Topics	Readings in Marine Ecological Processes 2017
(1)	(A) Marine Geology:	Plate tectonics (crust, types of plates, paleomagnetism, hot spots, terranes)	Plate Tectonics	Ch1 - Plate Tectonics
(2)		Seafloor (continental margins, ocean basins, hydrothermal vents, sediments)	Seafloor	Ch2 - Ocean Floor
(3)		Marine Sediments (size, origin, distribution)	Marine Sediments	
(4)	(B) Marine Physics:	Atmospheric Circulation (Coriolis effect, Circulation cells, up/downwelling, Storms, ENSO, NAO)	Ocean-Atmosphere	Ch4 – Atmospheric Circulation
(5)		Ocean Circulation (Forces, Surface Currents – Ekman transport, estrophic gyres, convergence/divergence zones;	Ocean circulation	Ch5 – Circulation of the Ocean
(6)		Waves (structure, classification,	Waves	Ch6 – Waves and Tides

		types, wind waves, interactions, other)		
(7)		Tides (equilibrium model, forces, structure); Tides (patterns, amphidromic system, currents)	Tides	
(8)	(C) Marine Chemistry:	Seawater, Salinity, Nutrient, Gases	Chemistry	Ch3 - Water and Ocean Structure
(9)	(D) Pelagic Ecosystems and Processes:	Pelagic Ecology (primary production, Phytoplankton diversity, Zooplankton diversity, trophic interactions)	Plankton lab	Ch7 – Marine Microbes
				Ch9 – Marine Communities
(10)	(E) Benthic Ecosystems and Processes:	Coasts (Tectonic coasts, erosion, deposition, biology, waves/storms)	Marine macrophyte (wet lab)	Ch8 - Multicellular Primary Producers
(11)		Marine Macrophytes (diversity, ecology) Benthic Ecology - Rocky substrate (benthos, zonation [stressors, competition, disturbance], keystone sp, kelps, corals, hydrothermal vents)	No Lab	Ch9 – Marine Communities
(12)		Benthic Ecology - Soft substrates (sand mudflats, salt marshes, mangroves, seagrasses, continental shelf, deep sea)	No lab scheduled	

6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Laboratory	15
Midterm	25
Peer assessment of complete draft of Term paper	5
Quality of Peer assessment of another student	5
Final Version of Term Paper	20
Final Exam	30
Total	100

6.2 Assessment Details

Laboratory (15%)

Date: 10 Weekly assignment due at end of each 1-hour laboratory

Learning Outcome: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21

- Course content: Laboratory and computer oceanography activities
- Regular attendance and successful completion of Laboratory assignments is required to obtain credit for course.
- No alternative times are available for missed labs

Midterm (25%)

Date: Wed, Feb 12, In class

- Course content: Lectures, & assigned readings
- Not all lecture slides will be posted on D2L and some important points are made orally by the instructor. It is, therefore, important to take notes during class and tutorial lectures.

Peer assessment of Complete draft of Term paper (5%)

Due: Fri, Mar 6, 11:59 PM, Posted to PEAR before 11:59 PM

Learning Outcome: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21

- Hand in the draft of your paper, which will be assessed by a peer (5% of your final grade).

Quality of Peer review of another student (5%)

Due: Fri, Mar 13, 11:59 PM, Posted to PEAR before 11:59 PM

Learning Outcome: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21

- submit the evaluation of a peer's paper -- the quality of your assessment will be evaluated (5% of your final grade)
- submission of peer review is required to receive peer assessment grade

Final Version of Term Paper (20%)

Due: Fri, Mar 27, 11:59 PM, 1. Posted to Pear & 2. posted to Courselink before 11:59 PM

Learning Outcome: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21

- Submit the final version of your paper (incorporate the comments from peer review)
- Draft term paper must be peer-reviewed electronically by your term paper partner assigned by PEAR before we will grade your submission
- Must be double-spaced in font size of 12 with one inch margins all around.
- Maximum length is 6 pages of text excluding Title page, References Cited, Figures, and Tables. Minimum length is 5 pages. Penalties for too long or too short.
- Figures and Tables should be placed after References Cited.
- Citation of references in text and List of References should be in the style of the journal, Limnology & Oceanography.
- Possible topics include:
 - Effect of a Physical Oceanographic (or a Biogeochemical) Process on Populations of a Marine Species,
 - Effect of a Physical Oceanographic (or a Biogeochemical) Process on a Marine Community
 - Effect of a Physical Oceanographic or (a Biogeochemical) Process on a Marine Ecosystem,
 - How changes in Physical Oceanographic (or Biogeochemical) Processes caused by human activities are Impacting Marine Ecosystems.
- Please check with professor before doing other topics.
- Minimum 10 references from the primary literature in peer-reviewed scientific journals with at least five being from the past three years. Can also include government websites and recent review articles.
- Submit final version twice: (1) post one final electronic pdf copy on PEAR for

- your instructors to read and (2) post one pdf copy on D2L for your classmates to read.
- Final paper is graded out of 100% but is worth 30% of course grade: You will receive a grade out of 20% for the paper + a grade out of 10% from the peer assessment (see above).
 - The same grading rubric will be used by the peer assessor to grade your first version and by your instructors to grade your final version.
 - Scientific Content: 50%
 - Creativity and Synthesis of ideas: 20%
 - Logical Organization and Writing Style: 20%
 - English/grammar, Punctuation: 10%
 - Total: 100%

Final Exam (30%)

Learning Outcome: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21

- Course content: Lectures & readings
- Multiple choice and written short answers – the final exam will cover all lectures and assigned readings, including the ones before the midterm but the emphasis will be on topics from after the midterm
- Not all material discussed in lecture is contained in lecture slides
- **Exam time and location is subject to change. Please see WebAdvisor for the latest information.**

7 Course Statements

7.1 Absence & Illness

- If you are absent from classes and/or labs during the semester, you will be expected to make up missed lecture and laboratory material on your own. When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact, and be prepared to provide supporting documentation. See the undergraduate calendar for information on regulations and procedures for

Academic Consideration:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

- When, for legitimate reasons, any assignments are missed, ensure that you have both given the instructor supporting documentation and obtained a written statement (e.g., email) of your revised grade evaluation from the instructor. If you miss an assessed item for medical or other authorized reasons, you will not be given a new assignment, but will have your final mark based on a proportionate adjustment of completed term work.

7.2 Late Policy

Late assignments are not permitted unless arranged prior to due date. Penalty is 10% per day of draft or of final copy of Term Paper unless valid compassionate or medical exemptions apply (Please see “When You Cannot Meet a Course Requirement” section below).

7.3 Exam Policy

- For more information about exam scheduling and conflicts, please consult the undergraduate calendar:
<http://www.uoguelph.ca/registrar/undergraduate/index.cfm?exams>

8 Department of Integrative Biology Statements

8.1 Academic Advisors

If you are concerned about any aspect of your academic program:

- Make an appointment with a program counsellor in your degree program. [B.Sc. Academic Advising](#) or [Program Counsellors](#)

8.2 Academic Support

If you are struggling to succeed academically:

- Learning Commons: There are numerous academic resources offered by the Learning Commons including, Supported Learning Groups for a variety of courses, workshops related to time management, taking multiple choice exams, and general study skills. You can also set up individualized appointments with a

learning specialist. <http://www.learningcommons.uoguelph.ca/>

- Science Commons: Located in the library, the Science Commons provides support for physics, mathematic/statistics, and chemistry. Details on their hours of operations can be found at: <http://www.lib.uoguelph.ca/get-assistance/studying/chemistry-physics-help> and <http://www.lib.uoguelph.ca/get-assistance/studying/math-stats-help>

8.3 Wellness

If you are struggling with personal or health issues:

- Counselling services offers individualized appointments to help students work through personal struggles that may be impacting their academic performance. <https://www.uoguelph.ca/counselling/>
- Student Health Services is located on campus and is available to provide medical attention. <https://www.uoguelph.ca/studenthealthservices/clinic>
- For support related to stress and anxiety, besides Health Services and Counselling Services, Kathy Somers runs training workshops and one-on-one sessions related to stress management and high performance situations. <http://www.selfregulationskills.ca/>

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website

<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website

<https://www.ridgetownc.com/services/accessibilityservices.cfm>

9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars

<https://www.uoguelph.ca/academics/calendars>
