



**University of Manitoba**  
**CHR Faculty of Environment, Earth and Resources**  
**Department of Environment and Geography**

## TABLE OF CONTENTS

<b>COURSE DETAILS</b> .....	<b>3</b>
<b>INSTRUCTOR CONTACT INFORMATION</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>GENERAL COURSE INFORMATION</b> .....	<b>3</b>
<b>COURSE GOALS</b> .....	<b>4</b>
<b>INTENDED LEARNING OUTCOMES</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>USING COPYRIGHTED MATERIAL</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>RECORDING CLASS LECTURES</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>TEXTBOOK, READINGS, MATERIALS</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>COURSE TECHNOLOGY</b> .....	<b>4</b>
<b>CLASS COMMUNICATION</b> .....	<b>4</b>
<b>EXPECTATIONS: I EXPECT YOU TO</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>STUDENTS ACCESSIBILITY SERVICES</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>EXPECTATIONS: YOU CAN EXPECT ME TO</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>CLASS SCHEDULE</b> .....	<b>6</b>
<b>LABORATORY EXPECTATIONS</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>LAB SCHEDULE</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>COURSE EVALUATION METHODS</b> .....	<b>8</b>
<b>GRADING</b> .....	<b>8</b>
<b>REFERENCING STYLE</b> .....	<b>8</b>
<b>ASSIGNMENT DESCRIPTIONS</b> .....	<b>8</b>
<b>ASSIGNMENT GRADING TIMES</b> .....	ERROR! BOOKMARK NOT DEFINED.
<b>ASSIGNMENT EXTENSION AND LATE SUBMISSION POLICY</b> .....	ERROR! BOOKMARK NOT DEFINED.

---

## COURSE DETAILS

---

<b>Course Title &amp; Number:</b>	Sea Ice in the Arctic Marine System, GEOG 4670 T05
<b>Number of Credit Hours:</b>	3
<b>Class Times &amp; Days of Week:</b>	10:30-11:20 am, Monday, Wednesday, and Friday
<b>Location for classes/labs/tutorials:</b>	243 Wallace Bldg., Variable
<b>Pre-Requisites:</b>	Course Instructor Approval

---

## Instructor Contact Information

---

<b>Instructor(s) Name:</b>	Dr. C.J. Mundy
<b>Office Location:</b>	582 Wallace Bldg.
<b>Office Hours or Availability:</b>	Please email me or approach me at the end of a lecture to make an appointment.
<b>Office Phone No.</b>	204-227-2532
<b>Email:</b>	<a href="mailto:CJ.Mundy@umanitoba.ca">CJ.Mundy@umanitoba.ca</a> - I usually reply within 48 hours.

---

### Course Description:

In this course students will gain a background on the importance and current knowledge of sea ice with a focus on the Arctic marine system. The course is highly interdisciplinary, touching on fields of geophysics, and physical, biological and chemical oceanography.

## General Course Information

---

Sea ice is a critical factor in our global climate, of which its current change represents the most globally recognized signal for our warming climate. Sea ice also provides habitat for a unique flora and fauna, influences exchange of gases across the ocean-ice-atmosphere interface and remains a challenge for industrial development in the Arctic Ocean. In this course students will gain a background on the importance and current knowledge of sea ice with a focus on the Arctic marine system. The course is highly interdisciplinary, touching on fields of geophysics, and physical, biological and chemical oceanography.

---

## Course Goals

---

The major goal of this course is to provide students with a background on the importance and current knowledge of sea ice with a focus on the Arctic marine system. Additionally, students will work on assignments that will help develop presentation, critical thinking and writing skills.

---

## Using Copyrighted Material

---

Please respect copyright. Copyrighted works, including those created by me, are made available for private study and research and must not be distributed in any format without permission. Do not upload copyrighted works to a learning management system (such as UM Learn), or any website, unless an exception to the *Copyright Act* applies or written permission has been confirmed. For more information, see the University's Copyright Office website at <http://umanitoba.ca/copyright/> or contact [um\\_copyright@umanitoba.ca](mailto:um_copyright@umanitoba.ca).

---

## Recording Class Lectures

---

Dr. C.J. Mundy and the University of Manitoba hold copyright over the course materials, presentations and lectures, which form part of this course. No audio or video recording of lectures or presentations is allowed in any format, openly or surreptitiously, in whole or in part without permission of Dr. Mundy. Course materials (both paper and digital) are for the participant's private study and research.

---

## Textbook, Readings, Materials

---

Suggested textbook – Thomas, D.N. and Dieckmann, G.S. 2010. *Sea Ice* (2nd Edition). West Sussex, United Kingdom: Wiley-Blackwell.

---

## Course Technology

---

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. The student can use all technology in classroom setting only for educational purposes approved by Dr. Mundy and/or the University of Manitoba Student Accessibility Services. Student should not participate in personal direct electronic messaging / posting activities (e-mail, texting, video or voice chat, wikis, blogs, social networking (e.g. Facebook) online and offline "gaming" during scheduled class time. If student is on call (emergency) the student should switch his/her cell phone on vibrate mode and leave the classroom before using it. (©[S Kondrashov](#). Used with permission)

---

## Class Communication

---

The University requires all students to activate an official University email account. For full details of the Electronic Communication with Students please visit: [http://umanitoba.ca/admin/governance/media/Electronic Communication with Students Policy - 2014 06 05.pdf](http://umanitoba.ca/admin/governance/media/Electronic_Communication_with_Students_Policy_-_2014_06_05.pdf)

Please note that all communication between myself and you as a student must comply with the electronic communication with student policy

([http://umanitoba.ca/admin/governance/governing\\_documents/community/electronic\\_communication\\_with\\_students\\_policy.html](http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html)). You are required to obtain and use your U of M email account for all communication between yourself and the university.

## **Expectations: I Expect You To**

---

**Class attendance:** A substantial part of my notes are provided during class and therefore, regular attendance is strongly encouraged.

**Questions during class:** If you would like quick clarification during a lecture, I encourage students to raise their hand and I will invite you to ask the question. However, if you think the question will take a longer to answer, you can come see me at the end of lecture or make an appointment with me via email to meet at a later time in my office.

**Policy regarding late assignments:** Students will not be permitted to write make-up tests or hand in assignments late, except for documented medical or compassionate reasons. Please make yourself familiar with the class schedule well in advance of mid-term tests and the final exam.

**Academic integrity:** Students should acquaint themselves with the University's policy on plagiarism, cheating, and examination impersonation (see University of Manitoba General Calendar).

## **Students Accessibility Services (SAS)**

---

If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

*Student Accessibility Services* <http://umanitoba.ca/student/saa/accessibility/>

520 University Centre

204 474 7423

[Student\\_accessibility@umanitoba.ca](mailto:student_accessibility@umanitoba.ca)

## **Expectations: You Can Expect Me To**

---

**Course notes:** Lecture handouts will be provided digitally to the student. Please note that a considerable amount of material beyond the course notes will be provided during the lecture. All material to appear in both the mid-term and final test will be provided during the lecture and/or in the course notes.

**Evaluative feedback:** Test 1 marks will be provided before the voluntary withdrawal deadline date, March 18.

**Humour:** I will attempt it sporadically.

## Class Schedule

This schedule is subject to change at the discretion of Dr. Mundy and/or based on the learning needs of the students but such changes are subject to Section 2.8 of the – [ROASS](#)- Procedure.

Date	Class Content	Required Readings or any Pre-class Preparation	Evaluation
Jan. 6- Apr. 6	<p><b><i>Sea ice - introduction</i></b></p> <ul style="list-style-type: none"> <li>- Importance</li> <li>- History</li> <li>- Arctic versus Antarctic</li> </ul> <p>Readings: Chapter 1 - Sea ice book</p> <p><b><i>Sea ice - structure and types</i></b></p> <ul style="list-style-type: none"> <li>- Growth and melt, structure, types and properties of sea ice</li> </ul> <p>Readings: Chapter 2 Sea ice book</p> <p><b><i>General Arctic oceanography and the influence of sea ice</i></b></p> <ul style="list-style-type: none"> <li>- Surface temperature, salinity, density, and currents in the world's oceans</li> <li>- Alpha vs beta oceans</li> <li>- Arctic water masses - focus on Pacific, Atlantic, and Polar water</li> <li>- the influence of sea ice on oceanography</li> </ul> <p>Readings: Chapter 2 of: Lalli, C.M. and Parsons, T.R. 1997. Biological oceanography, an introduction (2nd Edition), pp16-32. Jacobsson, M. et al. 2004. The Arctic Ocean: Boundary conditions and background information. In Stein, R. and Macdonald, R.W. (eds) The Organic Carbon Cycle in the Arctic Ocean, pp. 1-32. Carmack, E.C. (2007), The alpha/beta ocean distinction: A perspective on freshwater fluxes, convection, nutrients and productivity in high-latitude seas Chapter 3 Sea ice book</p>		

	<p><b>Sea ice - snow</b> Readings: Chapter 5 Sea ice book</p> <p><b>Sea ice - movement, variability, and paleo records</b> Readings: Chapters 4, 6, and 13 Sea ice book</p> <p><b>Sea ice - life</b> Readings: Chapters 7-11 Sea ice book</p> <p><b>Sea ice - biogeochemistry</b> Readings: Chapter 12 Sea ice book</p>		
Jan. 31	Research Paper Topic abstract due		Worth 5% of final mark
Feb. 17-21	Mid-term Break — no lectures		
Feb. 26	Test 1	A mix of True/False, short, and long answers	Worth 20% of final mark
Mar. 27	Research Paper due		Worth 25% of final mark
Mar. 30 – Apr. 3	Research Paper presentations		Worth 20% of final mark
Apr. 6	Test 2	A mix of True/False, short, and long answers	Worth 20% of final mark

## Course Evaluation Methods

---

A variety of methods to give all types of learners an opportunity to excel will be used in this course. The Lab Assignment, Research Paper presentation, and Lecture on Course Topic will be used to build upon the student's presentations skills and the Research Paper will help develop critical thinking and writing skills.

Due Date:	Assessment Tool	Value of Final Grade
Jan. 31	Research Paper Topic abstract due	5%
Feb. 26	Test 1	20%
Mar. 27	Research Paper due	25%
Mar. 30-Apr. 3	Research Paper presentation	20%
Apr. 6	Test 2	20%
Throughout	Class Participation	10%

## Grading

---

Letter Grade	Percentage out of 100	Final Grade Point
A+	90-100	4.5
A	80-89	4.0
B+	75-79	3.5
B	70-74	3.0
C+	65-69	2.5
C	60-64	2.0
D	50-59	1.0
F	Less than 50	0

## Referencing Style

---

Assignments should use a single reference style throughout corresponding to the format used in one of the following journals: Limnology and Oceanography, Polar Biology, Marine Ecology Progress Series, or Deep Sea Research.

## Assignment Descriptions

---

**TITLE**-Research Paper

**GOAL**-This assignment will help build presentation, critical thinking and writing skills

**PROCEDURE**-The Research Paper will consist of three different submissions: 1) Abstract and Reference List, 2) Presentation, and 3) Research Paper. The Research Paper is to focus on the influence of climate change on an aspect of the sea ice system covered in class. Dr. Mundy will assist in guiding the student to choose a topic for the paper and will use the Abstract and Reference List submission to provide feedback for the student at an early stage in the



development of his/her Research Paper. The three different submissions will consist of the following:

- 1) Abstract and Reference List
  - Tentative title – should explain the topic in a concise statement
  - Abstract – 4-5 sentences outlining the topic. The final statement should be a thesis statement, which clearly and concisely state's the goal of the Research Paper in a single sentence
  - Reference List – provide a list of 10 potential references that you will likely use in your research paper (Use a single journal reference style throughout (L&O, Polar Biology, MEPS, or Deep-Sea Research) and only cite journal articles and published books)
  
- 2) Presentation
  - 12 minute computer slide-based presentation summarizing Research Paper
  - 3 minutes of questions from the class and Dr. Mundy
  
- 3) Research Paper
  - 10 pages, double spaced, 12 pt TNR Font
  - **Abstract** – Summary of 150-250 words
  - **Introduction** – Describe the importance (motherhood) of your topic, provide a short background to set the stage for your paper, then conclude with thesis or objectives of your paper
  - **Body** – Summarize what is known and provide a critical review and analysis of your topic (i.e., What isn't known? Should additional questions be asked? How do you think the science can be moved forward?); Do not be afraid to include figures!!
  - **Conclusion** – This is not an abstract, conclude on what you discuss in the paper and particularly, relate back to your original thesis of the paper
  - **References** – Use a single journal reference style throughout (L&O, Polar Biology, MEPS, or Deep-Sea Research) and only cite journal articles and published books

**SUBMISSION GUIDELINES** – Submissions should be made as word documents via email (submissions 1 and 3) and as computer slide-based presentation during class time (submission 2).

**EVALUATION CRITERIA** – Each submission will be marked on the following:

- 1) Abstract and Reference List
  - The title and abstract will be marked on length (20%), information provided (30%), sentence structure (10%) and creativity (30%). The Reference List will be marked on correct format (5%) and appropriateness of citation (5%).

2) Presentation

- The Presentation will be marked according to time (20%), slide content, organization and quality (40%), creativity (20%), and ability to answer questions.

3) Research Paper

- The Research Paper will be marked according to length (10%) abstract (20%), introduction (20%), Body organization and content (30%), conclusion (20%) and References (10%)