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Instructions:

This is a sample syllabus template/workbook.

Content can be re-organized to meet the preferred styles of individual instructors.

Tables are used in the document to preserve formatting.

An automatic table of content is included. In order to update the table:

Choose the references tab in the ribbon above
Choose “update table”
Choose “update entire table”

Content order can be re-ordered to best suit your course needs

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

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COURSE DETAILS

Course Title & Number:	**Introduction to Hydrologic Optics (Short title - Hydrologic Optics)**, GEOG 4670 T01 / GEOG 7010 T45
Number of Credit Hours:	3
Class Times & Days of Week:	14:30-17:15 Wednesday
Location for classes/labs/tutorials:	590 (CEOS Boardroom) or 580 Wallace Building
Pre-Requisites:	Prearranged written consent of an individual instructor and permission of department head.

Instructor Contact Information

Instructor(s) Name:	Jens Ehn
Preferred Form of Address:	First name
Office Location:	580 Wallace Building
Office Hours or Availability:	16:00 – 17:00 Tues. and Thurs. (also by appointment)
Office Phone No.	(204) 480-1493
Email:	jens.ehn@umanitoba.ca
Contact:	For any questions please contact me by either email, phone, or in person. I will respond as soon as possible.

General Course Information

This course will provide students with a fundamental knowledge of hydrologic optics and optical sensor technology that will enable them to make quality measurements related to optical oceanography, be able to assess the uncertainties associated with the measurements, and compare the resulting data with remotely sensed ocean color measurements and products derived from them. Optical techniques are widely applied across many disciplines. Topics include basic physics of light and interaction of light with matter, radiometry and photometry, inherent and apparent optical properties, radiative transfer equation, optics of air-water interface, light absorption and scattering by seawater/sea ice constituents, optics of marine particles, basics of primary production, light fields within water/ice bodies and leaving water/ice bodies, optical instrumentation and measurement techniques. Instruments available in the laboratory will be used for training purposes, and field observations will be practiced when possible.

Textbook, Readings, Materials

Lectures will be provided to students in PPT or PDF format. The textbooks in this course are found online

Mobley, C. D., E. Boss, and C. Roesler (2011). Ocean Optics Web Book
(http://www.oceanopticsbook.info/)
Preisendorfer, R.W. (1976). Hydrologic Optics
(http://misclab.umeoce.maine.edu/education/HydroOptics/D:/START.pdf)
Mobley, C.D. (1994). Light and Water. Academic Press, San Diego.
(http://misclab.umeoce.maine.edu/education/Light&Water/D:/START.PDF)

Furthermore, published scientific papers and the book “Light and Photosynthesis in Aquatic Ecosystems” by J. T. O. Kirk will be used.

Using Copyrighted Material

Please respect copyright. We will use copyrighted content in this course. I have ensured that the content I use is appropriately acknowledged and is copied in accordance with copyright laws and University guidelines. 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.

Recording Class Lectures

Jens Ehn 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 by Jens Ehn. Course materials (both paper and digital) are for the participant's private study and research.

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 instructor and/or the University of Manitoba Disability 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

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). 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

I will make every attempt to be on time for class, and will stay after class as long as required to answer or discuss any questions. You may also interrupt me to ask questions or for clarifications any time during the lectures. If you miss a class or classes, you will be expected to independently read the course material. Powerpoint or PDF slides of the lectures will be provided. I will treat you with respect and would appreciate the same courtesy in return. See Respectful Work and Learning Environment Policy.

Students Accessibility Services

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

Class Schedule

This schedule is subject to change at the discretion of the instructor and/or based on the learning needs of the students but such changes are subject to Section 2.8 of the – ROASS-Procedure.

MONTH	DAY	TOPIC
January	10	Introduction + planning of schedule and lab (experiments)
	17	Basics on light and radiometry
	24	LAB1: particle size measurements + under-ice light mooring + light transmission
	31	Overview of AOPs + IOPs + absorption + fluorescence
February	7	LAB2: particle size measurements + under-ice light + light transmission
	14	Radiative transfer in seawater, snow and ice
	21	winter term break; no class
	28	Hudson Bay Summit meeting; no class
March	7	LAB3: particle size measurements + under-ice light + light transmission
	14	DEPLOY MOORING, ice sampling at a select location.
	21	Elastic and inelastic scattering, volume scattering and phase functions
	28	Applications of optical properties in oceanography and remote sensing
April	4	Student presentation of research paper

** In winter 2018, students will be taking part in developing a mooring for measuring irradiance below the ice, testing it, and possibly participate in deploying this mooring. Secondly, student will experiment with measuring transmittance through sea ice from laboratory grown ice (SERF or ice tanks). This will give students practical experience in ice and water sampling and optical measurements.

** Voluntary withdrawal date: 16 March

Assignment Descriptions

Lecture instructions

- Given in April at the end of course.
- Discuss with instructor to select a topic that falls in the broad range of class topics. If it helps student's research, then all the better.
- Prepare presentation (powerpoint) in advance so instructor can review and comment on it.
- Length of lecture is 45-60 minutes.

Research paper instructions

- Due in last quarter of course (~5 April).
- Length: ~2000 words excluding references.
- Presentation: ~15-30 minutes.
- Present on any analyzes done as a part of the course.
- Chose a topic that falls in the broad range of class topics, and that links to experiment, sampling and sample analyzes conducted by the student.
- Presentation given after handing in research paper.
- The assignment should use the APA reference style as outlined in the text. See e.g. http://www.bibme.org/citation-guide/apa/ for examples.

Laboratory Expectations

Active participation and writing a research paper that includes a description and presentation of laboratory work or experimentation done as a part of the course (see assignment above)

Course Evaluation Methods

This course is evaluated with three exams and a research paper/presentation. There is no final exam.

	Value Contributing to Final Grade:
Class participation	30%
Lecture on course topic	30%
Research paper + presentation	40%
Presentation (20%)	
Final submission (20%)	

Grading

The Grading Standard for this course is as follows:

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