

GEOL4465/5410 Physical Oceanography



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Section Information:

Lecture GEOL4465/5410-001

Lab GEOL4465/5410-011

Time and Place of Class Meetings:

Lecture: Tuesday & Thursday 9:30 – 10:50 Geosciences Room 109

Lab: Tuesday, 11:00 – 11:50, Geosciences Room 202

Required Textbooks and Other Course Materials: Stewart, R., Introduction to Physical Oceanography, http://oceanworld.tamu.edu/home/course_book.htm

Additional books recommended:

Talley L.D., G.L. Pickard, W.J. Emery, J.H. Swift, 2011. Descriptive Physical Oceanography: An Introduction (Sixth Edition), Elsevier, Boston, 560 pp.

Open University Course Team, 2001. Ocean Circulation, Publisher: Butterworth-Heinemann, Paperback, 240pp, Series: Open University Oceanography Ser., ISBN: 0080363695 online
<http://www.sciencedirect.com/science/book/9780750652780>

Pond, S., and G.L. Pickard, 1983. Introductory Dynamical Oceanography. 2nd edition, 329pp, Butterworth-Heinemann.
ISBN 10: 0-7506-2496-5

Marshall, J. and R. Plumb, 2008. Atmosphere, Ocean and Climate Dynamics – Academic Press, ISBN 9780125586917

Description of Course Content: This course offers an introduction to physical processes in the oceans. The oceans are an important part of the global climate system. Changes in the global climate system, such as global warming, do influence the immense amount of heat, moisture, and momentum stored in the ocean. In this course, we will introduce some elementary knowledge of the ocean, its circulation, and its impact on the global climate. Prereq: general physics, and calculus or cons. instr.

Student Learning Outcomes: After completion of this class, students will be familiar with the key terminology pertaining to the oceans and will have a well-rounded understanding of the major physical process in oceanography as well as the complex interactions among the various components of the climate system. The student will be able to:

- Identify reasons why ocean sciences are important and affect, e.g., our lives and the world economy.
- Explain the major features of the seafloor.
- Summarize the major physical and chemical properties of seawater and how each affects the ocean circulation
- Understand the feedbacks of the ocean's processes with processes in other components of the Earth's climate system (atmosphere, terrestrial biosphere, cryosphere, and geosphere).
- Analyze the atmospheric circulation system.
- Understand principles of the ocean circulation (due to friction, rotation of the Earth, and pressure changes)
- Analyze the wind-driven and density-driven ocean circulation
- Quantify turbulence and its impact on the ocean circulation.
- Describe the principles involved in the generation of waves and tides and evaluate their effects on coastal processes and energy generation.
- Identify the consequences of a rise in sea level on the coastal zone and society, and possible mitigation and adaptation strategies.
- Identify major factors leading to climate change, and assess future climate projections.
- Discuss the societal relevance of physical oceanography for global initiatives and political decisions.

This knowledge will enable the students to better understand topics of great societal importance, such as future climate change, tsunamis, large-scale propagation of pollutants, and environmental sustainability.

Course Schedule Version GEOL 4465/5410 Physical Oceanography, Spring 2015

“As the instructor for this course, I reserve the right to adjust this schedule in any way that serves the educational needs of the students enrolled in this course.” –Arne M.E. Winguth 08/17/14

Chapter	Days	Topics	Reading Text ¹	Problem Sets
1	Jan. 20	Historical Review	1-2	
2	Jan. 22	Physiography of the Oceans Dimensions, bathymetry, echosounding	3	Introduction
3	Jan. 27 Jan. 29	Atmosphere Radiation, wind system, wind stress	4	#1: Ch. 2
4	Feb. 3 Feb. 5	Oceans Heat Budget Heat budget and transport, and its variability	5	#2: Ch. 3
5	Feb. 10 Feb. 12	Temperature, Salinity, and Density Measurements and concepts	6	#3: Ch.4
6	Feb. 17 Feb. 19	Equations of Motions Momentum and mass conservation	7	#4: Ch. 5
7	Feb. 24, 26	Turbulence and Mixing Molecular viscosity and eddy viscosity	8	#5: Ch. 6
1. EXAM	Mar. 3	Material Chapter 1-6	1-7	
8	Mar. 5, 17	Response of Currents to Wind Ekman transport, Langmuir circulation	9	#6: Ch. 7&8
	Mar. 9 to 13	Spring Recession		
9	Mar. 19, 24	Geostrophic Currents Hydrostatic equilibrium and geostrophy	10	
Fieldtrip	Sat. Mar 21	Joe Pool Lake Fieldtrip	Notes	8:30 – 5pm
10	Mar. 26, 31	Wind Driven Circulation Sverdrup & Munk theory, equatorial currents	11, 14	#7: Ch. 9&10
11	Apr. 2, 7	Deep Sea Circulation Stommel and Aron theory	13	#8: Ch. 11
2. EXAM	Apr. 9	Material Chapter 7-12	7-12	
12	Apr. 14, 16	Waves Shallow and deep water waves, Tsunamis	16	#9: Ch. 12
13	Apr. 21, 23	Tides Theory of tides and prediction of tides	17	
14	Apr. 28, 30	Climate Change & Variability Present and future, ENSO, AMO, PDO	14, 15 & notes	
Paper	Apr. 28	Final Due Date Project Paper		
15	May 5-7	Review Graduate Student Project Presentations		15 min each team
FINAL	May 14	FINAL EXAM 8:00-10:30 am Rm GS 109		

¹ Stewart, R., Introduction to Physical Oceanography,
http://oceanworld.tamu.edu/home/course_book.htm

Course Policies and Grading

Grading and Grade Calculation:

<u>Grading:</u>	Lab Portion:	25% of course
	Lecture Portion:	75% of course
	Lecture Portion:	
	Lecture Tool Quizzes	4 % of course
	Quizzes (best 3 of 4)	6% of course (2% each)
	Exams(2)	30% of course (15% each)
	Project (1)	15% of course
	Final Exam	20% of course

Final grade calculation:

$0.25 \times \text{lab} + 0.10 \times \text{quizzes} + 0.20 \times \text{exams} + 0.15 \times \text{project} + 0.30 \times \text{final exam}$

Score will be translated into a grade based on class average. Maximum score in each category is 100%.

Grades will not be released over the phone or by email. Grades must be either obtained in person or from the UTA online database.

Grading: Lecture Portion: 75% of course; Lab Portion: 25% of course

Exams:

Exams will be problem exercises and multiple-choice questions.

Exams must be taken at the scheduled time. Make-up exams can be only taken in cases of illness or family emergency. A note from the University disciplinary officer or doctor may be required in these cases. Students who do not take an exam receive zero points as a grade on that exam. Make-up exams are scheduled and set by the instructor.

Quizzes:

Lecture quizzes are not announced. The 3 best quizzes will be counted towards the total grade. There are no make-up quizzes. Lecture Tool quizzes are taken on-line in class.

Field trip:

Is strongly recommended (corresponding to 2 lab extra credit) and the foundation for the project paper.

Project paper:

A signature research assignment in the area of oceanography is designed to stimulate critical thinking skills, teamwork skills, communication skills, and empirical and quantitative skills. Physical and biogeochemical measurements (e.g. temperature, salinity, oxygen, nutrients) from the lake fieldtrip will be analyzed as part of the project. Total report length for each team will be 6 pages including figures and references, letter size, single-spaced, 12 pt times new

roman font. Each team will present the project in a 10-minute presentation (including discussion). The project paper has to be written in own words in a scientific style

Format of paper submission: Only pdf via safe assign on blackboard

Identical copy of a term paper from web or other sources (plagiarized papers or web pages) will result in an F.

Teamwork:

Teamwork is encouraged to stimulate scientific discussion in lecture and lab. Teamwork is allowed in the lab and project with **maximum team size is three students**. In oral presentation each team member need to present.

Required Readings:

Readings listed on the syllabus should be completed before the lecture. The lectures will be designed with the assumption that you have a basic understanding of the assigned material.

Attendance:

Attendance is recommended and may be taken occasionally. Lack of attendance may influence the final grade.

Academic Integrity:

Academic dishonesty (such as cheating, plagiarism, taking an exam for another person, etc.) will not be tolerated in any form and will be disciplined in accordance with University regulations and procedures.

Blackboard Info: <http://www.uta.edu/blackboard/students/index.html>

Expectations for Out-of-Class Study: A general rule of thumb is this: for every credit hour earned, a student should spend 3 hours per week working outside of class. Hence, a 3-credit course might have a minimum expectation of 9 hours of reading, study, etc.

Drop Policy: Students may drop or swap (adding and dropping a class concurrently) classes through self-service in MyMav from the beginning of the registration period through the late registration period. After the late registration period, students must see their academic advisor to drop a class or withdraw. Undeclared students must see an advisor in the University Advising Center. Drops can continue through a point two-thirds of the way through the term or session. It is the student's responsibility to officially withdraw if they do not plan to attend after registering. **Students will not be automatically dropped for non-attendance.** Repayment of certain types of financial aid administered through the University may be required as the result of dropping classes or withdrawing. For more information, contact the Office of Financial Aid and Scholarships (<http://www.uta.edu/aao/fao/>).

Americans with Disabilities Act: The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the *Americans with Disabilities Act (ADA)*. All instructors at UT Arlington are required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Any student requiring an accommodation for this course must provide the instructor with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Only those students who have officially documented a need for an accommodation will have their request honored. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at www.uta.edu/disability or by calling the Office for Students with Disabilities at (817) 272-3364.

Title IX: The University of Texas at Arlington is committed to upholding U.S. Federal Law "Title IX" such that no member of the UT Arlington community shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity. For more information, visit www.uta.edu/titleIX.

Academic Integrity: Students enrolled all UT Arlington courses are expected to adhere to the UT Arlington Honor Code:

I pledge, on my honor, to uphold UT Arlington's tradition of academic integrity, a tradition that values hard work and honest effort in the pursuit of academic excellence.

I promise that I will submit only work that I personally create or contribute to group collaborations, and I will appropriately reference any work from other sources. I will follow the highest standards of integrity and uphold the spirit of the Honor Code.

UT Arlington faculty members may employ the Honor Code as they see fit in their courses, including (but not limited to) having students acknowledge the honor code as part of an examination or requiring students to incorporate the honor code into any work submitted. Per UT System *Regents' Rule* 50101, §2.2, suspected violations of university's standards for academic integrity (including the Honor Code) will be referred to the Office of Student Conduct. Violators will be disciplined in accordance with University policy, which may result in the student's suspension or expulsion from the University.

Lab Safety Training (required): Students registered for this course must complete all required lab safety training prior to entering the lab and undertaking any activities. Once completed, Lab Safety Training is valid for the remainder of the same academic year (i.e., through the following August) and must be completed anew in subsequent years. There are no exceptions to this

University policy. Failure to complete the required training will preclude participation in any lab activities, including those for which a grade is assigned.

Electronic Communication: UT Arlington has adopted MavMail as its official means to communicate with students about important deadlines and events, as well as to transact university-related business regarding financial aid, tuition, grades, graduation, etc. All students are assigned a MavMail account and are responsible for checking the inbox regularly. There is no additional charge to students for using this account, which remains active even after graduation. Information about activating and using MavMail is available at <http://www.uta.edu/oit/cs/email/mavmail.php>.

Student Feedback Survey: At the end of each term, students enrolled in classes categorized as “lecture,” “seminar,” or “laboratory” shall be directed to complete an online Student Feedback Survey (SFS). Instructions on how to access the SFS for this course will be sent directly to each student through MavMail approximately 10 days before the end of the term. Each student’s feedback enters the SFS database anonymously and is aggregated with that of other students enrolled in the course. UT Arlington’s effort to solicit, gather, tabulate, and publish student feedback is required by state law; students are strongly urged to participate. For more information, visit <http://www.uta.edu/sfs>.

Final Review Week: A period of five class days prior to the first day of final examinations in the long sessions shall be designated as Final Review Week. The purpose of this week is to allow students sufficient time to prepare for final examinations. During this week, there shall be no scheduled activities such as required field trips or performances; and no instructor shall assign any themes, research problems or exercises of similar scope that have a completion date during or following this week *unless specified in the class syllabus*. During Final Review Week, an instructor shall not give any examinations constituting 10% or more of the final grade, except makeup tests and laboratory examinations. In addition, no instructor shall give any portion of the final examination during Final Review Week. During this week, classes are held as scheduled. In addition, instructors are not required to limit content to topics that have been previously covered; they may introduce new concepts as appropriate.

Emergency Exit Procedures: Should we experience an emergency event that requires us to vacate the building, students should exit the room and move toward the nearest exit. When exiting the building during an emergency, one should never take an elevator but should use the stairwells. Faculty members and instructional staff will assist students in selecting the safest route for evacuation and will make arrangements to assist individuals with disabilities. More details: UT Arlington Procedure 7-6: Emergency/Fire Evacuation Procedures (<https://www.uta.edu/policy/procedure/7-6>).

Student Support Services: UT Arlington provides a variety of resources and programs designed to help students develop academic skills, deal with personal situations, and better understand concepts and information related to their courses. Resources include tutoring, major-based learning centers, developmental education, advising and mentoring, personal counseling, and federally funded programs. For individualized referrals, students may visit the reception desk at University College (Ransom Hall), call the Maverick Resource Hotline at 817-272-6107, send a message to resources@uta.edu, or view the information at www.uta.edu/resources.

Writing Center.: The Writing Center, 411 Central Library, offers individual 40 minute sessions to review assignments, *Quick Hits* (5-10 minute quick answers to questions), and workshops on grammar and specific writing projects. Visit <https://uta.mywconline.com/> to register and make appointments. For hours, information about the writing workshops we offer, scheduling a classroom visit, and descriptions of the services we offer undergraduates, graduate students, and faculty members, please visit our website at www.uta.edu/owl/.

Emergency Phone Numbers In case of an on-campus emergency, call the UT Arlington Police Department at **817-272-3003** (non-campus phone), **2-3003** (campus phone). You may also dial 911.

For non-emergencies, contact the UTA PD at 817-272-3381

Librarian to Contact: Antoinette Nelson (nelsona@uta.edu)

Other important library information

Library Home Page..... <http://www.uta.edu/library>
Subject Guides <http://libguides.uta.edu>
Subject Librarians <http://www.uta.edu/library/help/subject-librarians.php>
Database List.....
<http://www.uta.edu/library/databases/index.php>
Course Reserves
<http://pulse.uta.edu/vwebv/enterCourseReserve.do>
Library Tutorials
<http://www.uta.edu/library/help/tutorials.php>
Connecting from Off- Campus <http://libguides.uta.edu/offcampus>
Ask A Librarian <http://ask.uta.edu>