GEOL 380/PGEOG 705.69* - Fall 2014  
Advanced Oceanography with MatLab. The Physics of the Oceans  
Professor Haydee Salmun

**Lecture hours/location:**  
Fridays 2:10 – 5:00 pm; Hunter North, Computer Lab 1090B

**Professor Salmun Contact Information**  
Office: Room1035 Hunter North  
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Tel.: 212-772-5224  
Office Hours: Tuesday/Friday, 1:00 – 2:00, **please kindly make an appointment**

(*) Catalog title: Advanced Oceanography: Chemistry and Physics of the Oceans.

(**) **Note:** the best way to contact me is via email – (1) You must include the course name or number in your subject line (2) You must include your entire name in your email (3) I try to answer all emails within 24 hours. Allow for a 48 hour delay on the weekends.

**Note for Graduate Students:**  
Although the course description and topics described below are the same for graduates and undergraduates, the expectations of your work and general performance are not. We will invite you to use the opportunity that this course offers to develop some of your own research tools, skills and interests and to combine these in a major project/presentation at the end of the semester. There will be more discussion on this item at the start of the semester.

*Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice. Updates will be posted regularly on BlackBoard.*

**Course Prerequisite:** This is an advanced, quantitative science course and we expect students to have a basic foundation in physical sciences and mathematics. We will require a strong commitment to learning the quantitative skills offered.

**Course Description:**  
The oceans play a significant role in how the climate system responds to anthropogenic perturbations. To understand past, present and future climate, therefore, we need to know and understand our oceans. Oceanography is multidisciplinary. It offers a wonderful opportunity to review and to apply many of the concepts taught in the major traditional disciplines such as physics, chemistry, biology and mathematics. This course will offer an in-depth ‘tour’ to the fascinating and complex subject of Oceanography and an introduction to quantitative methods in oceanography using Matlab. This is a science-base course and it will require that students learn to understand, and be willing to work with, physical and quantitative concepts. It requires that students be prepared to learn the basics of scripting/programming syntax and logic, which in turn is one of the great skills to be acquired in this course.
The two main objectives of this course are (1) to further students’ understanding of the ocean in the context of the earth system, and (2) to expand students’ skills in quantitative analysis using Matlab, a high-level language and interactive environment for numerical computation, visualization and programming. Labs are meant to provide students with a number of identifiable skills that can be applied in other courses as well as in work environments.

**Expected learning outcomes**

1. **Theory**
   At the end of the semester, students would be expected to have a basic understanding of
   - the world’s oceans as a major component of earth-system science
   - the ocean strong influence on climate including Earth’s surface temperature, by influencing the amount of CO₂ in the atmosphere, the transport of heat from the tropics to polar regions, the operation of the hydrological cycle and the Earth’s carbon cycle
   - how to explore the way the oceans ‘work’ by studying processes that involve other components of the Earth system, particularly the atmosphere
   - how these processes function together to determine and regulate Earth’s climate, the circulation of the atmosphere and ocean and the recycling of elements

2. **Skills**
   At the end of the semester, students would be expected to have acquired basic quantitative skills that will allow them to
   - use basic mathematical calculations to quantify physical processes under study
   - understand the importance of data visualization and explain graphs and charts in detail
   - use basic Matlab to perform calculations and generate charts
   - gain a basic appreciation of modeling environmental problems in a marine context through the use of the Matlab software
   - gain an appreciation of computer models and data analysis

**Computer Labs**

Class time will be devoted to lab work in 1090B Hunter North. Labs will consist of exercises designed to introduce students to some of the concepts and skills necessary to study problems in a marine environment in a quantitative fashion. These include basic mathematical concepts, as well as using computer simulations, or models. Windows operating system, MS WORD and MS EXCEL, is expected. A greater emphasis will be placed on analysis of data and results.

**Group work** – is allowed and encouraged for all labs. For specific projects and assignments, if students choose to work in groups, students must: (1) inform the professor before the due date which students are working together; and (2) hand in only one lab per group, with all students names on the lab.

Topics to be covered include:

1. The atmosphere-ocean system: causes of the general circulation of air and water and the global wind system. **Focus:** atmosphere-ocean interactions.
2. Wind-driven ocean currents. **Focus:** energy and energy distribution in the ocean.
3. The North Atlantic circulation. **Focus:** the subtropical gyre and the Gulf Stream – observations, theory and modeling.
4. Other major ocean current systems: equatorial current systems, circulation at high latitudes, monsoonal circulation. **Focus**: role of waves (large scale) in the ocean and atmosphere-ocean interactions (El Niño-Southern Oscillation).

5. The South Atlantic circulation and the Overturning Meridional Circulation. **Focus**: (1) Western Atlantic shelf circulation: Malvinas and Brazilian Currents and the Brazil/Malvinas Confluence; (2) Eastern Atlantic circulation: Benguela and Agulhas Currents.

6. Temperature, Salinity, Pressure & Density in the Ocean. **Focus**: water masses, mixing, global heat and water fluxes and deep ocean circulation.

**Recommended Text Book:**


This text book is obtained from [http://oceanworld.tamu.edu/home/course_book.htm](http://oceanworld.tamu.edu/home/course_book.htm) for **FREE**. Students can download a copy in PDF format, and can make spiral-bound copies (high quality) at any copy center for the cost of the printed pages.

**Recommended Reference Text Books:**


This Open Source book is obtained from [http://oceanworld.tamu.edu/resources/oceanography-book/contents.htm](http://oceanworld.tamu.edu/resources/oceanography-book/contents.htm)

2. *(2)* *Ocean Circulation*. Edited by Angela Colling, The Open University (re-issued 2007)

ISBN: 978-0-7506-5278-0

Other materials (i.e., selected journal articles) will be made available to the class, as needed.

**Grades:**

Grades will be based on class participation, midterm exams (two, covering basic theories discussed in class), work in the lab and the lab reports, and a final course project. Class participation is mandatory and constitutes a significant 10% of the final grade. We plan for:

- Lab work/reports 30%
- Class participation 10%
- 2 Midterm Exams 20% each (total 40%)
- 1 Final Exam/Project 30%

Grading scale: 90-100=A; 80-89=B; 70-79=C; 60-69=D; <60=F.

**About examinations and grades:**

- [http://catalog.hunter.cuny.edu/content.php?catoid=15&navoid=1433](http://catalog.hunter.cuny.edu/content.php?catoid=15&navoid=1433)
- Examinations will be of approximately 2 hours exam and must be turned in promptly. If you arrive late, you lose that time.
- Make-up exams are ONLY available in extreme cases, and with medical (or other) forms that confirms the absence.
• I will automatically agree to the CR-NCR option ONLY if the conditions stated in the CR-NCR form are satisfied: all course work has been completed and you earned grades such that you accumulate at least 50 points total in the course (this includes labs+exams+extra, if you earned any). Students on probation are not eligible for this option.

**Classroom policies:** You are expected to have read the reading listed for each class day before class on that date. There is no texting permitted in the classroom. Laptops (and other tablets) are not necessary and will not be permitted in class. Special considerations will be given in exceptional cases, in which case permission to use laptop has to be obtained from the instructor.

*The professor reserves the right to alter or add topics and assignments as needed.*

**Attendance & Tardiness in handing work reports**
Attendance is required at all lectures. Class time will be partly devoted to lectures and part to computer lab work. Up to two unexcused absences from lectures will be tolerated. Only one unexcused absence is allowed from lab sessions. Grades WILL be affected by absences. Late submission of work will not be accepted without prior consent of the instructor and grades will be adversely affected by systematic lateness.

**My Teaching Philosophy:** My goal in teaching is to help students in becoming confident and responsible professionals and to make this experience an enjoyable one. My approach to teaching involves being a facilitator in the learning process as opposed to being the authoritarian lecturer at the front of the room with a “one-way information transfer” style. I understand and respect individual differences in learning and do my best to promote learning in the classroom by working with individual differences rather than against them. At the same time, I wish to impart technical skills and a sense of responsibility by encouraging students to play the role of professionals in the classroom.

I expect students to put their best effort in this course. This involves participating in the in-class exercises, reading the assigned material, doing the homework, editing when necessary until they are clear and correct, and preparing for quizzes and exams.

**Lecture:** I will spend part of the lecture time explaining the key concepts of oceanography and discuss, when appropriate, solution of problems that will be assigned as home work. You are expected to devote time outside the classroom to understand the concepts, and review questions that I may ask in class. I expect that lectures will give you a clear idea of what is expected in quizzes and exams.

**Finally:** It is important to start with a good study habit. Consistency is the key. Forming study groups is extremely helpful. Use my time and any resource available to you throughout the semester. Make progress steadily as the material in this course cannot be understood the night before the exam. Concentrate on understanding rather than ‘regurgitating’. Put out your best effort everyday!

The following are useful tips to do well in this or any class:

• Attend class & take detailed notes.
• Read the assigned material in the text (or other) before coming to class.
• Re-write your notes as soon as possible after class. This will allow you to fill in the details still fresh in your memory, and prepare questions for the next time the class meets.
• Test yourself by answering the questions in the book and in class.
• Carefully study the diagrams and charts in the book and in the lectures.

As with all courses at Hunter College:

Academic Dishonesty: Please be advised that plagiarism, dishonesty, or cheating in any portion of the work required for this course will be punished to the full extent allowed according to Hunter College regulations.

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.

See the following report by the Hunter College Senate for more details: http://www.hunter.cuny.edu/senate/assets/Documents/Hunter%20College%20Policy%20on%20Academic%20Integrity.pdf

ADA Policy
In compliance with the American Disability Act of 1990 (ADA) and with Section 504 of the Rehabilitation Act of 1973, Hunter College is committed to ensuring educational parity and accommodations for all students with documented disabilities and/or medical conditions. It is recommended that all students with documented disabilities (Emotional, Medical, Physical, and/or Learning) consult the Office of AccessABILITY, in Room E1214B, to secure necessary academic accommodations. For information and assistance: (212)772-4857 or (212)650-3230.

A more detailed course syllabus will be available at the beginning of class via BlackBoard. **Syllabus gets updated throughout the semester, as needed. Check regularly for updates.**