MSCI3001 / MSCI5004
Physical Oceanography / Oceanographic Processes

COURSE OUTLINE
SESSION 2 2015

Convenors:
Dr. Alex Sen Gupta, a.sengupta@unsw.edu.au, phone: 9385 8951
CCRC, Level 4, Matthews Building

COURSE INFORMATION

Teaching staff

Dr. Alex Sen Gupta (course convenor)
Group: Climate Change Research Centre (CCRC)
Room: 454, CCRC, Level 4, Matthews Building
Phone: 9385 8951
Email: a.sengupta@unsw.edu.au
Consultation times: Monday

Course description

Undergraduate/Postgraduate Core / Elective
Units of Credit: 6UOC
Contact hours per week: 4 hours

Relation to other courses

This course builds on MSCI2001 "Introductory Marine Science". Concepts introduced in the course are further developed in MATH2241 "Introduction to Atmosphere and Ocean Dynamics" and CLIM2001 'Atmospheric Physics' and is a good basis for a more mathematically oriented approach provided in MATH3261 "Fluids, Oceans and Climate". Other courses related to climate system include CLIM3001 'Theory, Observations and Models of Climate' and CLIM3004 'Earth and Climate Hydrodynamics'.

Overall Description

The way water circulates around the oceans has direct impacts on climate as well as marine ecology. In this course, we will dive into the way the ocean works. From the East Australian Current to the global conveyor belt, and from eddies to beach waves. We will cover the dynamics and properties of ocean water and the way those are measured, and apply it to problems like El Nino, the great garbage patches and Global Warming.

The course covers an introduction to the most important physical processes in the ocean: including ocean circulation, water-masses, waves, tides, mixing, upwelling, estuaries, coastal and large-scale currents, climate variability and change. The course is a broad introduction to physical oceanography. We study how the oceans are affected by winds, thermal forcing, the earth's rotation, as well as understanding the role of bottom topography and coastal boundaries. Throughout the course and across the different topics, the relationship between the physics and biology of the sea is explored, e.g., coastal upwelling, hurricanes, El Niño and the ocean carbon cycle. Different techniques and methods for measuring the oceans will be presented, as well as an introduction to the concepts behind ocean modelling.

The formal teaching components of MSCI3001/5004 consist of these activities:
(a) lectures,
(b) tutorials,
(c) computer labs

The MSCI-3001/5004 course runs 4 hours per week through all of Session II. The details are as follows:
Lecture: Mat Sci G10
Mon 12:00PM - 2:00PM weeks: 2-9,10-13 (first lecture 3rd August)
Lab: Bioscience G11
Thu 3:00PM - 5:00PM weeks: 1,3,5,7,9,11 (first lab 30th July)
Tutorial: CCRC Lecture Room, Mathews level 4
Fri 11:00AM - 1:00PM weeks: 2,4,6,8,10,12 (first tute 7th August)

The 4 hours per week normally include 2 hours of lectures, and in alternating weeks 2 hours tutorial, or 2 hours of practical work in the computer lab. A more detailed schedule is available below.

Course Aims

This is primarily a descriptive physical oceanography course. The main aim is to give the students a physical understanding of some of the dominant processes that occur in the ocean. We will identify a set of physical processes that govern the motion of fluids in the ocean, the atmosphere, and the coastal environment. We will investigate the scales over which geophysical flows occur and, by simplifying the physical processes involved, find quantitative descriptions of motion in the ocean. Throughout the course we will highlight how ocean physics affects the marine biology and chemistry.

Outcomes

After successfully completing this course students will be able to use basic physical concepts to describe important oceanographic processes. For a given problem students will be able to apply scaling arguments to investigate the dominant processes. This course is structured so as to develop the analytical thinking abilities of the students.

Students will gain a grounding in Matlab one of the most widely used analysis/visualization tools used in science. This is a highly valuable skill for those interested in continuing in science.

Teaching

New ideas and techniques are introduced in lectures. Students get their chance to develop their analytical skills by applying them to specific tasks in tutorials. **It will assist the students enormously if the problem sets are attempted between the lecture and the tutorial the following week.** The computer laboratory sessions will allow the students to develop the skills required to analyse various data sets commonly used in oceanographic research, graphically visualise data and interpret their results.

There will be one component of the course where students will further focus on a specific oceanographic topic of their choice. More details on this research project will be provided in the first lecture.

ASSESSMENT

The assessments will require the students to solve problems and describe processes similar to those seen in lectures and tutorials. In all cases, marks can be gained for the correct application of mathematical techniques relevant to the given problem.

The research project will allow you to delve more deeply into a subject of interest.

The **final mark for MSCI3001** will be calculated as follows:

4 Comp Labs	16%	(4+12%)
Assignment 1	11%	
Assignment 2	15%	
Research Project/presentation	13%/ 5%	
Final examination	40%	

The **final mark for MSCI5004** will be calculated as follows:

4 Comp Labs	18%	(5+13%)
Assignment 1	12%	
Assignment 2	16%	
Research Project/presentation	14%/ 5%	
Final examination	35%	

If not otherwise stated, all pieces of assessment are due by Friday 5pm of the week indicated

Assignments can be submitted through moodle (preferred). If this is not possible you may submit by email to a.sengupta@unsw.edu.au (an email confirmation will be provided) or via the submission box is located outside the CCRC. Late submissions will incur a 10% decrease in the overall mark per day. Assignments handed in more than 7 days late will not be marked. Extensions will normally only be considered if arranged prior to the due date.

To pass this course, satisfactory performance across ALL components of the course is required.

The rules and procedures regarding additional assessment can be found on the School of Mathematics web site at www.maths.unsw.edu.au/students/current/policies/addasspolicy.html

ACADEMIC HONESTY AND PLAGIARISM

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.* Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†
- For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.
- Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.
- Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.
- The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

The Learning Centre website is main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:
www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre. Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne.

The University regards academic misconduct as a very serious matter.

Students found guilty of academic misconduct are usually excluded from the University for two years. Contingent on the individual circumstances, however, the period of exclusion can range from one session to permanent exclusion from the University.

The following are some of the actions which have resulted in students being found guilty of academic misconduct in recent years:

- use of unauthorised aids in an examination;
- submitting work for assessment knowing it to be the work of another person;
- improperly obtaining prior knowledge of an examination paper and using that knowledge in the examination;
- failing to acknowledge the source of material in an assignment, or the extent of indebtedness to others.

It is the responsibility of each student to use correct methods of acknowledging other people's ideas. In cases where students collaborate with other students, the extent of collaboration should be included as well as the names of all students who contributed to the piece of work. Anyone not already familiar with correct forms of acknowledgement is strongly advised to consult the UNSW Learning Centre Web Page on *Avoiding Plagiarism*

(http://www.lc.unsw.edu.au/plagiarism/index.html)

COURSE SCHEDULE

Week	Start of week (Monday)	**Lecture** *Mat Sci G10* Monday. 12 – 2pm	**Tutorial** CCRC seminar room Mathews, Level 4 Friday. 11-1pm **Lab** Biosci G11 Thursday 3-5pm	**Assessments** due by Friday 5pm
1	27 Jul		Lab0: Matlab Intro	
2	3 Aug	Introduction	Tutorial	
3	10 Aug	Observing the Ocean	Lab1: Matlab ocean basics	
4	17 Aug	Ocean Dynamics 1	Tutorial	
5	24 Aug	Ocean Dynamics 2	Lab2: Matlab ENSO	Lab1: Matlab ocean basics due
6	31 Aug	Wind Forced Motion 1	Tutorial	Research Project outline due
7	7 Sep	Wind Forced Motion 2	Lab3: Matlab ENSO	
8	14 Sep	Wind Forced Motion 3	Tutorial	Assignment 1 due
9	21 Sep	Waves	Lab4: Matlab ENSO Data	
MSB	28 Sep			
10	5 Oct	The Global Conveyor	Tutorial Text	Assignment 2 due
11	12 Oct	Oceans & Climate	Discussion: Geoengineering	Lab3: Matlab ENSO due
12	19 Oct	Regional Examples (Guest Lectures)	Tutorial/ Exam prep	
13	26 Oct	Revision		Research Project due

The ordering of some of the later lectures may still change. **In addition we will hold a mini workshop (in week 12 or 13) where students will make their presentations**. This will be arranged for a time that is mutually available for everyone. This may be an early evening close to the end of semester.

EXAM POLICY

Every year there appear to be more students seeking to have exams outside the exam period because of other commitments. The **University expects that all students, including exchange students, will be available, in Sydney, throughout the scheduled exam period**. That they have booked an overseas holiday in this period is not valid justification for permitting them an examination outside the normal period. Having exams early is a major inconvenience, and potentially, unless a special paper is set, a threat to the integrity of the examination process. Attendance at exams is expected. **For session 2 2014 the PROVISIONAL examination period is the 28th October to the 15th November**.

RESOURCES FOR STUDENTS

Outline Lecture Notes

Lecture notes will be made available online. These lecture notes are intended to give a brief outline of the course to be used as an aid to learning. They are not intended to be a replacement for attendance at lectures, problem classes or tutorials. You should bring the course notes to all classes in this subject.

Web page

Course notes, slides, assessments, tutorial and lab information will be made available at: *http://web.maths.unsw.edu.au/~alexg/MSCI3001.html*

Check this site regularly for any course updates.

Textbooks

There are no prescribed textbooks for this course, however the following are suggested for further reading.

- Ocean Circulation (Open University) (UNSW Open Reserve WP/1458)
- Introductory oceanography, H.V. Thurman (PQ551.46/121A, PQ551.46/121)
- An introduction to the world's oceans, A.C. Duxbury and A. Duxbury (P551.46/96)
- Descriptive physical oceanography, G.L. Pickard and W.J. Emery (P551.46/10C, P551.46/10D)
- Introductory dynamical oceanography, Pond and G.L. Pickard (P551.47/16E)
- Regional oceanography: an introduction, M. Tomczak and J.S. Godfrey (P551.46/142)
- Waves, tides, and shallow-water processes (Open University) (P551.47/35A, P551.47/35B)
- Introduction to Physical Oceanography, J.A. Knauss (Prentice Hall)

Syllabus

1. Description of the Oceans and Definitions
2. Stratification, Stability and the Ocean's Thermohaline Circulation
3. The Physics of Ocean Flow
4. Waves and Tides
5. Unforced Motions in the Oceans
6. Wind Forced Motion and Large-Scale Gyre Circulations
7. Measuring and Modelling the Oceans
8. The role of ocean in climate

CONTINUAL COURSE IMPROVEMENT

Student feedback is very important to continual course improvement. This is demonstrated within the School of Mathematics and Statistics by the implementation of the UNSW Course and Teaching Evaluation and Improvement (CATEI) Process, which allows students to evaluate their learning experiences in an anonymous way. The resulting evaluations are ultimately returned to the course convenor, who will use the feedback to make ongoing improvements to the course.

Over the past two years, this course has been improved by the introduction of a field trip and computer labs. Student responses to both these have been very positive.

ADMINISTRATIVE MATTERS

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equity and Diversity Unit (9385 4734 or www.equity.unsw.edu.au/disabil.html). Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

To be used if submitting written work via CCRC submission box

Climate Change Research Centre
Assignment Cover Sheet

Course Code: _____

Course Name: _____

Lecturer: _____

Student Name: _____

Student ID: _____

Student Academic Misconduct Declaration
www.lc.unsw.edu.au/plagiarism

I declare that this assessment item is my own work, except where acknowledged, and has not been submitted for academic credit elsewhere, and acknowledge that the assessor of this item may, for the purpose of assessing this item:

- Reproduce this assessment item and provide a copy to another member of the University; and or,
- Communicate a copy of this assessment item to a plagiarism checking service (which may then retain a copy of the assessment item on its database for the purpose of future plagiarism checking).

I certify that I have read and understand the University rules in respect of Student Academic Misconduct.

(By signing this declaration you are agreeing to the conditions above)

Signature: _____Date: _____

CCRC RECEIVED DATE STAMP: