

Learner's Manual

Tropical Oceanography

OCN5003



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of the European Union



INSTITUTE OF
OCEANOGRAPHY
AND ENVIRONMENT

Table of Contents		Page no.
1.0	Introduction	1
2.0	Course structure	2-3
	Course planning	
	Mode of Delivery	4
	Teaching Strategy	5
	Learning Materials	6
	Additional learning materials (video/notes/articles)	7
	Case Study Presentation	8
	Assessments	9
3.0	Others	
	Questionnaire for students	10
	Course pamphlet	11
	Course reading list	12

1.0 Introduction

This course exposes students to the important ideas and concepts of Oceanography in the tropical region. It will focus on ocean physico-chemical and bio-geochemical processes as well as the interactions between the atmosphere and ocean and how this coupled process drives the ocean productivity in the tropical regions. This course also will explore the current impact that effecting our oceanographic system that includes atmosphere–ocean climate system, ocean pollution and geomorphology changes. The course concludes with the role of the climate change and the connection between human activity and the current warming trend. This evidence of changes in many facets of oceanography sciences will be explored through ocean model, satellite images and field data analysis. In addition, the course will offer new insight on global initiatives that address related topics especially in addressing current challenges of countries in Tropical Region.

By end of the course, we hope the students will achieve these outcomes;

1. Explain the fundamentals of oceanography in the tropical oceans as an interactive system in which physical, chemical, and geological factors are inter-related through ocean processes, nutrient dynamics and ocean productivity
2. Evaluate the scientific findings through data and information from oceanographic data analysis. Articulate scientific arguments in addressing past, present and future climate change issues on tropical ocean.

2.0 Course Structure

2.1 Course Planning

Chapters	Description	Additional Information
Chapter 1	<p>Introduction to Tropical Oceanography</p> <ul style="list-style-type: none"> - History of ocean exploration - Important discoveries of Tropical Ocean <p>Ocean Observation</p> <ul style="list-style-type: none"> - Advance Instrumentation and observation - World Ocean Database and accessibility 	<p>Comprehensive discussion on the Global Ocean Scientific Report 2020 produced by the IOC-UNESCO. This will provide wider worldview on the issues and challenges facing by oceanography of the world.</p>
Chapter 2	<p>Physical processes of South China Sea</p> <ul style="list-style-type: none"> - Regional oceanography and air-sea interactions - Dynamics of the ocean circulation - Water characteristics and monsoonal influence 	<p>Explore some examples of ocean data provided by WOD as a real example for seasonal overview of few selected tropical area.</p> <p>Learn ODV Toolbox</p>
Chapter 3	<p>Upwelling dynamics and processes</p> <ul style="list-style-type: none"> - Coastal upwelling dynamics - Air-sea interactions - multi temporal patterns - Observation and numerical modelling analysis 	<p>Review of particular case studies base on selected area by referring to current journal or book publications</p>
Chapter 4	<p>Tropical Ocean and Climate Change</p> <ul style="list-style-type: none"> - Climate changes effect on ocean processes and productivity - Long term changes and future impact towards the ocean characteristics 	<p>Essay preparation and Presentation to address unique changes towards topical area from the perspective of climate change issues</p>

2.0 Course Structure

2.1 Course Planning

Chapters	Description	Additional Information
Chapter 5	Seawater Chemistry <ul style="list-style-type: none"> - Seawater composition - Nutrient cycle Air-sea interaction	Comprehensive review and presentation by the students about 4 topics related to nutrient cycle. <ol style="list-style-type: none"> 1. carbon cycle 2. Nitrogen cycle 3. Phosphorus cycle 4. Silica cycle
Chapter 6	Ocean Productivity <ul style="list-style-type: none"> - Primary Productivity - Net primary production (NPP) Ocean current and productivity	Review about the ocean productivity. Two way discussion where student respond to teacher question during the lecture.
Chapter 7	Marine Pollution <ul style="list-style-type: none"> - Type of pollution - Sources of pollution Impact to organisms and environment	Review about the several significant pollution in marine environment, impact to ecosystem , organisms and human. Comprehensive written assignment about Ocean Acidification.
Chapter 8	Introduction to geological oceanography. <ul style="list-style-type: none"> - Geological time scale - General geomorphology of ocean basin and coastal area 	Explore some basic knowledge on Earth history and timeline. Students are exposed to the general morphology of ocean basin and coastal area.
Chapter 9	Major geological events <ul style="list-style-type: none"> -The formation of oceans (plate tectonic theory) -Snow ball Earth to Hot houses: How climate has changed over 3 million years. 	Explore the scientific records of climate change throughout millions of years. Discussion with students about what the future climate would be like based on the lessons from the past.
Chapter 10	Paleooceanography <ul style="list-style-type: none"> - Global sea level changes during Quaternary - Factors affecting sea level changes. - Predicting future sea level with lesson from the past. 	Comprehensive discussion about sea level changes and factors affecting the changes. The discussion was made based on the prediction of the latest IPCC report available. Several case studies on the impact of sea level rise are discussed with students.

2.0 Course Structure

2.2 Mode of Delivery



Courses were thought online using Webex application. Link to the Webex sessions will be provided by teacher through emails or e-learning platform.

2.0 Course Structure

2.3 Teaching Strategy



Lecture

Lecture delivery methods are in form of online meet up (Webex) and pre-recorded lecture videos.

Students will be supplementary materials such as blogs/websites/ published reports/ You Tube video.



Discussion

Several case studies or reports related to chapters taught will be comprehensively discussed. The discussion will include live discussion through Webex application or through writing where students can share their opinion through Google sites or Google Jamborad.



Google Sites








Jamboard

2.0 Course Structure

2.4 Learning Materials



Lectures







-  **Lecture 1: Introduction** 8.8MB Powerpoint presentation Uploaded 25/04/21, 11:12
This lecture provides an overview of the importance of the Tropical region from the perspective of Oceanography and the global efforts in oceanography data and management
-  **Lecture 2: Properties of Seawater and Global Ocean Observation System** 6.4MB Powerpoint presentation Uploaded 25/04/21, 11:18
The lecture explains the different scale of seawater properties by region and describe the Global Ocean Observation System initiatives that serve the world with accessible datasets from the entire world.
-  **Lecture 3: Air Sea Interaction** 4.2MB Powerpoint presentation Uploaded 28/04/21, 11:42
The lecture will provide basic comprehension on the concept of global atmospheric system and its influence on ocean current
-  **Lecture 4: Upwelling Dynamics** 4.8MB Powerpoint presentation Uploaded 28/04/21, 11:45
Introduction to the concept and dynamics of upwelling at regional scale
-  **Lecture 5: Upwelling Case Studies** 31.9MB Powerpoint 2007 presentation Uploaded 28/04/21, 11:46
Discussion on various dynamics and dynamics that influence upwelling in specific region

All learning materials such as lecture notes, videos and articles related to the learning topics will be made available online in e-Learning platform.

2.0 Course Structure

2.4 Additional learning materials (video/notes/articles)

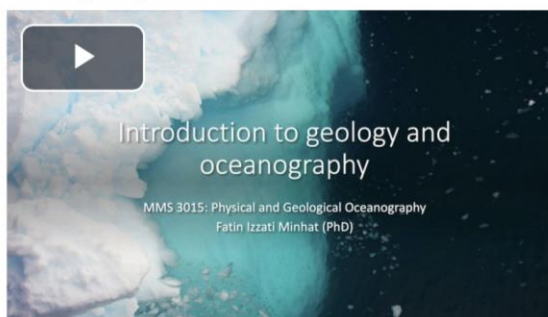
Video Related to Subject

-  Why Is the Ocean Salty?
-  Why We Need to Stop Plastic Pollution in Our Oceans
-  Are You Eating Plastic for Dinner?
-  Plastic Pollution, Our Oceans, Our Future...
-  How Does Mercury Get Into Fish?
-  Why 99% of ocean plastic pollution is "missing"

 Lecture 1- Introduction to geological oceanography 93MB Powerpoint 2007 presentation Uploaded 16/06/21, 00:11

This topic provide introduction to the field of marine geology including the geological time scale.

Here's a video on the introduction to geological oceanography.



 Lecture 2- General morphology of the ocean floor 29.1MB Powerpoint 2007 presentation Uploaded 16/06/21, 00:15

This topic provide introductions to the geomorphological features of the ocean floors and theories of the plate tectonic.



 Lecture 3 - The Major Geological Events 25.5MB PDF document Uploaded 24/06/21, 22:01

2.0 Course Structure

2.4 Case study presentation



A group presentation based on the latest review of IPCC AR5 report. Students will discuss the issues, mitigation and future planning regarding climate and oceanography topics.

2.0 Course Structure

2.5 Assessment

Type of assessment	% of final marks
Tutorial/Discussion1 - GOSR Report discussion	5
Assignment 1 - WOD data and ODV Toolbox	15
Tutorial/Discussion2 - Nutrient cycle presentation	10
Assignment 2 - Ocean Acidification	10
Tutorial/Discussion3 -The climate change throughout geological timeline.	5
Assignment 3 -Sea level changes: factors and implication	15
Final Assignment - Climate Change essay and Presentation	40
Total	100

3.0 Others

3.1 Questionnaire for students

<https://docs.google.com/forms/d/e/1FAIpQLSem9DU-HsskXmq8fGLL-NM03V0D352r0KCyS9DYWntzMrFOdg/viewform>



3.0 Others

3.2 Course pamphlet

“
WE OFFER UNIQUE LEARNING EXPERIENCE, AND THE TOPICS THAT CLOSE TO CURRENT CHALLENGES THAT FACED BY OUR OCEAN ENVIRONMENT
”

“
CONTEXTUAL LEARNING ON OCEANS, CLIMATE CHANGE AND POLLUTION THROUGH INTEGRATED APPROACH THAT INCLUDES THE USE OF GLOBAL DATA AND ANALYTICAL SOFTWARE
”

This subject will be offered by Institute of Oceanography and Environment (INOS) to all postgraduate students during Starting this Semester (Sem II - 2021)

COMPULSORY TO INOS POSTGRADUATE STUDENTS REGISTERED IN 2021

This course will explore the current impact that effecting our oceanographic system that includes atmosphere-ocean climate system, ocean pollution and geomorphology changes. The course highlights the role of the climate change and the connection between human activity and the current warming trend. This evidence of changes in many facets of oceanography sciences will be explored through ocean model, satellite images and field data analysis.

OCN 5003 'TROPICAL OCEANOGRAPHY'

NEW POSTGRADUATE ELECTIVE COURSE - 'ONLINE MODE'

OPEN FOR REGISTRATION IN ONLINE MODE
Class Started

UMT **INOS** INSTITUTE OF OCEANOGRAPHY AND ENVIRONMENT

MARE
MARINE COASTAL AND DELTA SUSTAINABILITY FOR SOUTHEAST ASIA

In Collaboration

Co-funded by the Erasmus+ Programme of the European Union

3.0 Others

3.3 Course reading list

No.	References
1	Garrison, T. 2012. Oceanography: An invitation to marine science (8th Edition). Brooks Cole, Canada.
2	John. H. Sampson and J. Sharples, 2012. Introduction to the Physical and Biological Oceanography of Shelf Seas. Cambridge University Press
3	Robert H. Stewart, 2007. Introduction To Physical Oceanography. Dept. of Oceanography, Texas A & M University.
4	Riley, J. P. and R. Chester, 1971. Introduction to Marine Chemistry. Academic Press. London.
5	R. Chester and T.D. Jickells, 2013. Marine Geochemistry. Wiley-Blackwell
6	Jim Murray, 2001. Chemical Oceanography Lecture Note. Univ. Washington.
7	Seibold, E. & Berger, W. H. 2010. The sea floor: An introduction to marine geology. Springer.
8	Global Ocean Scientific Report 2021, UNESCO
9	Intergovernmental Panel of Climate Change, Annual Report 5