Marine Environment and Renewable Energy MEMO 2003

Course Presentation

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

MARE

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

Table of Contents

1.0 Introduction to course

This course is an elective course with 3 credits (4 ECTS), offered specifically to the students of Master of Science (Mechanical Engineering) with Ship/ Offshore Technology track; and was developed by Faculty of Mechanical Engineering, Universiti Teknologi Malaysia.

This course is designed to give students an understanding of the science of marine environment particularly waves and tides, and how this affects efforts to exploit energy from these resources. Students will first be introduced to fundamentals of oceanography and marine meteorology. It explains the fluid physical characteristics and movement on the earth. As such, the student will have a clear understanding of the weather that results from the interaction between the atmosphere and the sea surface.
Students will then learn on marine environmental issue related to ship and offshore structure. This course also introduces the main forms of marine renewable energy particularly wind, wave and tidal, focusing on the technology and resource assessment associated with each.

By the end of the course, students will success to:

1. Students will be able to apply the physics of oscillations and waves with applications to wind, waves and tides.
2. Students will be able to analyse the effects marine of marine environment on vessels and offshore structures.
3. Students will be able to appraise various aspects of investment in renewable energy development using appropriate techniques for finance
4. Students will be able to demonstrate ability on project investment evaluation and design analysis ethically based on available standard guidelines.
5. Students will be able to critically analyze problems of available marine energy converters and propose suitable device for selected region.

2.0 Course Structure

2.1 Course Planning

WEEK	TOPIC
Week 1	Origins of the atmosphere and ocean basins Fluids: atmosphere and water
Week 2	Atmospheric pressure and wind
Week 3	Waves and tides
Week 4	Oceanic circulation
Week 5	Climatology ; weather system
Week 6	Weather observations; weather forecasting
Week 7	Climate change modelling; influence of climate on ocean processes; environmental issues related to ship and offshore structure
Week 9	Context of marine energy; key energy concepts
Week 10	Wave energy conversion; wind energy conservation
Week 11	Marine current conversation
Week 12	Development appraisal; planning and resource availability, financial appraisal, economic viability
Week 13	Practical, environmental, and economic aspects of marine renewable energy; practical constraints and cabling, economic assessment, environmental impacts assessment
Week 14	Case studies

2.0 Course Structure

2.2 Teaching Method

Details on Innovative T&L practices:

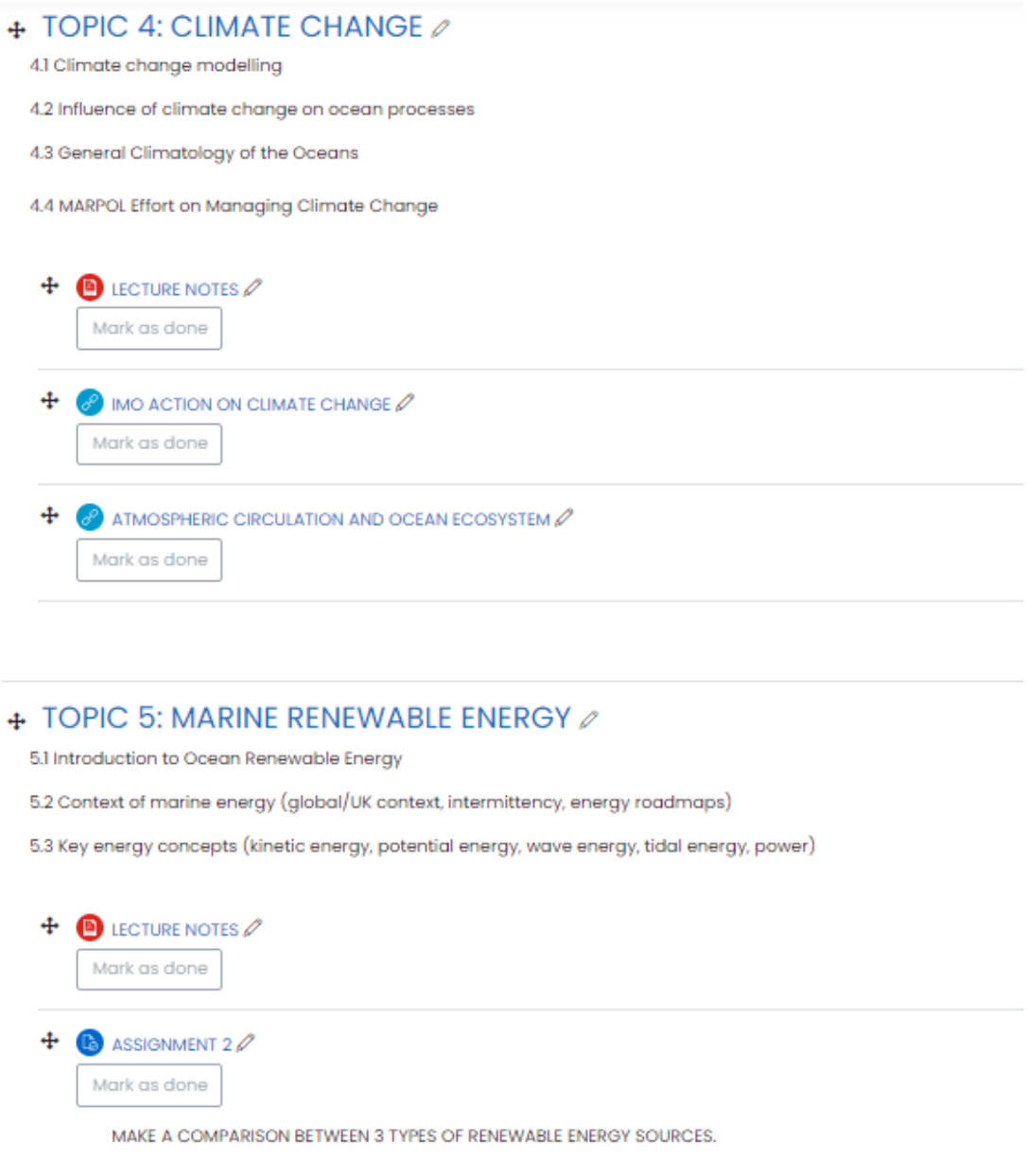
No.	Type	Implementation
1.	Active learning	Conducted through in-class activities
2.	Case-based learning	Conducted through project assignments. Students are given current environmental issues and are required to analyse and give recommendation on the issue by project report and presentation.

Distribution of student Learning Time (SLT) Course content outline	Teaching and Learning Activities					TOTAL SLT
	Guided Learning (Face to Face)			Guided Learning Non-Face to Face (Assessment and preparation)	Independent Learning Non-Face to face (Revision)	
CLO	L	T	P	O		
CLO1	9h			2h	8h	9h	28h
CLO2	9h			2h	8h	8h	27h
CLO3	9h				8h	9h	26h
CLO4	9h			2h	7h	8h	26h
CLO5						8h	8h
Total SLT	36h			6h	31h	42h	115h

	Continuous Assessment	PLO to be assessed	Percentage	Total SLT
1	Project 1	Cognitive Skill, Entrepreneurship	15	Include in learning time for teaching activities
2	Project 2	Digital Skill, Ethics and professionalism skills	15	
3		Knowledge	5	
4	Assignment 2	Knowledge	5	
5	Test	Knowledge, Cognitive Skill	20	2h
6	Final Examination	Knowledge, Cognitive Skill	40	3h
	Total			
			Grand Total	120h

2.0 Course Structure

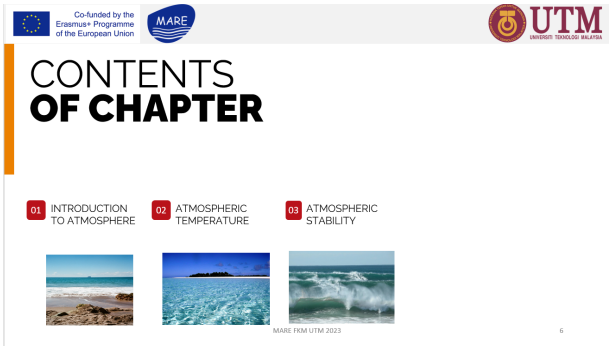
2.3 Learning Material

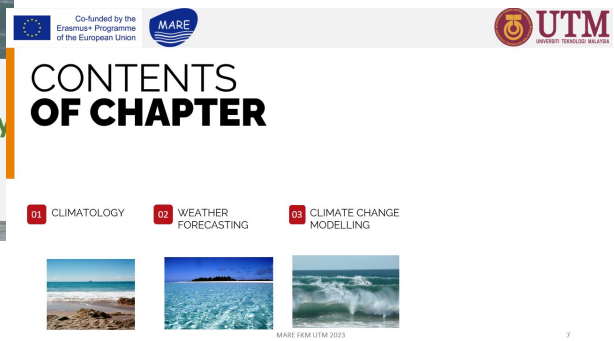


Lecture information will be uploaded in e-Learning Platform

2.0 Course Structure

2.3 Learning Material

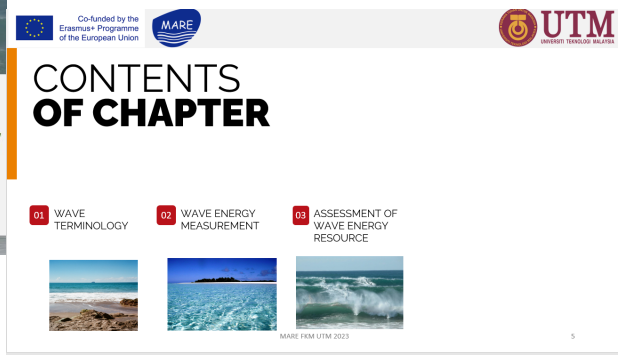


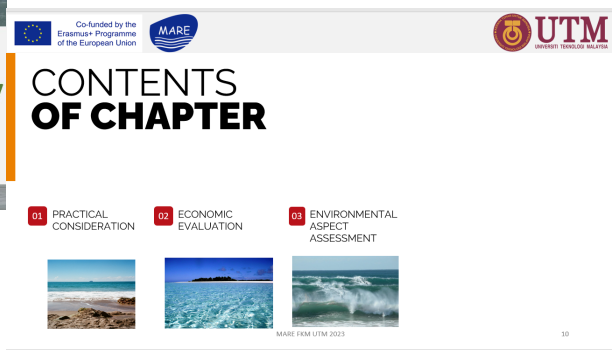


Lecture information will be uploaded in e-Learning Platform

2.0 Course Structure

2.3 Learning Material





Lecture information will be uploaded in e-Learning Platform

2.0 Course Structure

2.3 Learning Material

AUTHOR'S BIOGRAPHY

Dr. Farah Ellyza Hashim is currently a senior lecturer in Faculty of Mechanical Engineering, Faculty of Engineering.

Her current research interests include marine renewable energy, marine environment, ship design and naval architecture. Some of the courses that she taught for undergraduate level is Ship and Offshore Design, Naval Architecture, Marine Transport, and others Mechanical subjects.

Apart from teaching and research activities, she is also involved in assisting and facilitating Prof. Dr. Omar Yaakob in conducting series of short courses in the field of Naval Architecture and Ship Design to various Maritime Companies and Government Agencies.

Dr. Arifah Ali is currently a senior lecturer and the track coordinator for postgraduate programme (MSc in Mechanical Engineering) for ship and offshore technology track in Faculty of Mechanical Engineering, Faculty of Engineering.

Her current research interests include ship powering and propulsion, propeller design, advance marine design, maritime safety, and marine tourism. She is actively involved in conducting hydrodynamic model test and CFD simulation of ship and offshore structure at Marine Technology Center, UTM. Some of the courses that she taught for undergraduate and postgraduate level are Ship Resistance, Naval Architecture, Marine Management and Environment, Maritime Safety and Risk, Marine Transport, and others Mechanical subjects.

Apart from teaching and research activities, she is also involved in conducting series of short courses in the field of Naval Architecture and Ship Design to various Maritime Companies and Government Agencies.

Lecture information will be uploaded in e-Learning Platform

2.0 Course Structure

2.4 Course Reference

1. Neill, S. P., & Hashemi, M. R. (2018). Fundamentals of ocean renewable energy: generating electricity from the sea. Academic Press.

2. Babarit, A. (2017). Ocean wave energy conversion: resource, technologies, and performance. Elsevier.

3. Clark, R. N. (2013). Small wind: planning and building successful installations. Academic Press.

4. Pedlosky, J. (2013). Ocean circulation theory. Springer Science & Business Media.

5. Cornish, M., & Ives, E. (2013). Reeds maritime meteorology. A&C Black.

6. Noone, K. J., Sumaila, U. R., & Diaz, R. J. (2013). Managing ocean environments in a changing climate: sustainability and economic perspectives. Newnes.

7. Sørensen, J. D., & Sørensen, J. N. (Eds.). (2010). Wind energy systems: Optimising design and construction for safe and reliable operation. Elsevier.

3.0 Course Assessment

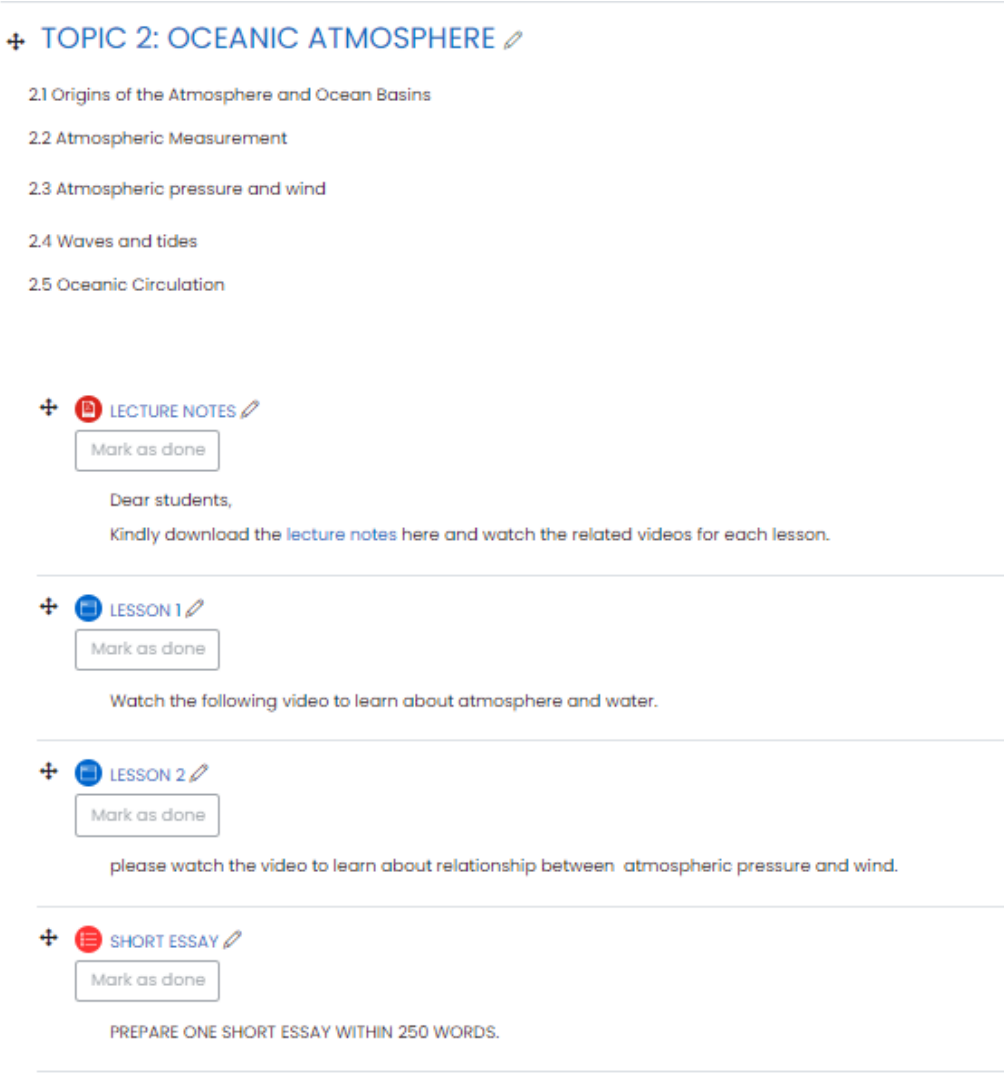
3.1 Assignment/ Project

No	Learning Outcomes	Assessment Activity
1	Ability to conceptualize on marine environment and renewable energy knowledge	Assignment: -Preparation of summary on the measurement tools and technology related to marine environment.
2	Ability to analyze available marine renewable energy converter and propose suitable design for Malaysia sea state conditions. Appraise various aspects of investment in renewable energy development using appropriate techniques and Excel functions for finance	Project: -Contribution to the group case-study projects about marine renewable energy in Asia -Contribution to the preparation and completion of project report and presentation

- Universiti Teknologi Malaysia (UTM) is committed to academic integrity. Plagiarism, collusion, and cheating are strictly prohibited.
- Student is expected to submit work and present as your own without copy text or material from other sources.
- PLAGARISM DETECTION SOFTWARE (Turnitin) will be used to test the similarity from online sources.

3.0 Course Assessment

3.1 Assignment/ Project



3.0 Course Assessment

3.1 Assignment/ Project

TOPIC 1: SUSTAINABILITY OF MARINE ENVIRONMENT

1.1 Introduction to Sustainability Principles

1.2 Sustainability of Marine and Maritime Operation

1.3 IMO regulations for sustainability of marine environment

FORUM ON SUSTAINABLE DEVELOPMENT IN MARITIME INDUSTRY

Mark as done

Dear students, please participate in this forum.

1) Read any articled related to sustainability considered in maritime operation.

2) Discuss the level of effort taken by different countries.

3) Provide way of improvement if you find any weaknesses in the applied sustainable moves.

TOPIC 6: ENERGY CONVERSION

6.1 Wave energy conversion

6.2 Marine current conversion

SIMULATION PROJECT

Mark as done

Hello students,

The task of the project is to conduct a short project which involve:

1) evaluating one marine renewable energy device based on CFD simulation (You need to use Server in Marine Technology Center, UTM as the simulation require powerful PC)

2) analysing the viability of the device with consideration of cost and environment

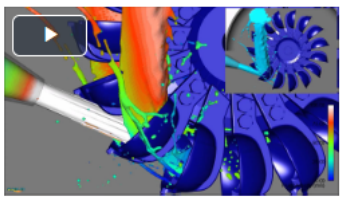
This is the link to submit the video PRESENTATION of project.

The aims of project is to assess student in

1. Appraise various aspects of investment in renewable energy development using appropriate techniques and Excel functions for finance

2. Demonstrate ability on project investment evaluation and design analysis ethically based on available standard guidelines

EXAMPLE OF CFD SIMULATION



3.0 Course Assessment

3.2 Test / Final Exam Regulation

- Final examination contributed to 40% of the course mark.
- Student should write your examination answer entirely on your own without unacknowledged input from the others.
- Distributing, receiving, possessing any information in electronic, printed or any other form or cooperated with any other person when completing the examination is STRICTLY prohibited.

4.0 Course Evaluation

4.1 Questionnaire for Students

COURSE EVALUATION

MEMO 2003
Marine Environment and Renewable Energy

Google Form:
https://forms.gle/CYoka8euej24N2RC7