

## SCBE 306 Marine Biology: Course information and Syllabus

### 1. Course Code and Title

In Thai	วททส ๓๐๖ ชีววิทยาทางทะเล
In English	SCBE 306 Marine biology

2. Number of Credits 4 (3-2-7) (Theory 3 hours, Practice 2 hours, Self-study 7 hours/week)

### 3. Curriculum and Course Type

3.1 Program of Study Bachelor of Science Program in Bioresources and Environmental Biology (International Program)

3.2 Course Type Specific Course for SCBE

### 4. Course Coordinator and Instructor

#### 4.1 Course Coordinators

Dr. Pagkapol Pongsawakul

Department of Biology, Faculty of Science, Mahidol University

Email: [pagkapol.pon@mahidol.edu](mailto:pagkapol.pon@mahidol.edu)

Dr. Janjarus Wattanachote (Co-course coordinator)

Institute of Marine Science, Burapha University

Email: [janjarus@buu.ac.th](mailto:janjarus@buu.ac.th)

#### 4.2 Instructors

- Pagkapol Pongsawakul (Ph.D. in Biology, Salk Institute/University of California San Diego)

Department of Biology, Faculty of Science, Mahidol University

Phayathai Campus, Bangkok, 10900 Thailand

- Janjarus Wattanachote (Ph.D. in Marine Science, Kasetsart University)

- Sumaitt Putchakarn (Ph.D. in Biological Sciences, Burapha University)

- Arachaporn Anutaliya (Ph.D. in Oceanography, Scripps Institute of Oceanography/University of California San Diego)

Institute of Marine Science, Burapha University

Saen Suk, Chonburi, 20131 Thailand

### 5. Semester/Class Level

5.1 Semester	1 <sup>st</sup> semester/ 3 <sup>rd</sup> year students
5.2 Number of Students Allowed	Approximately.....30.....students

6. Pre-requisite

SCBE 201 General zoology  
SCBE 202 General Zoology Laboratory  
\*or upon program committee approval

7. Co-requisites

none

8. Study Site Location

Virtually via Zoom or WebEx  
Mahidol University, Salaya Campus  
Institute of Marine Science, Burapha University (BIMS)

## Course information

### Course Goals

This course provides an introduction to marine organisms and the physical and biological processes that affect them. The course begins with oceanography, marine biodiversity, marine habitats and the physical and chemical factors influencing marine organisms and their communities in marine environments. The course then transitions into an exploration of various marine organisms, as well as the physiological adaptations these organisms have to the marine environment.

### Objectives of development/revision

#### Course Objectives

The aim of this course is to provide basic knowledge and practical skills for students so that they will be able to pursue research and study in marine biology and related fields in the future. The students are expected to be able to describe biological and physiological components of the ocean and identify common species found in the ocean. In addition, the students should be able to collect information, interpret data, and discuss the results as well as suggest an approach to solve environmental problems of the ocean.

#### Course-level Learning Outcomes (CLOs)

By the end of the course, students are able to

1. CLO1 Describe biological and physiological components of the ocean
2. CLO2 Identify common species found in the ocean
3. CLO3 Collect information, interpret data, and discuss the results
4. CLO4 Apply knowledge to suggest an approach to solve environmental problems of the ocean.

### Course Description

Natural history of marine organisms, exclusive of protozoa and insects; types of environment in the ocean, with special reference to shallow tropical seas; the relation of biological distributions to the physical and chemical environment; the effects of environmental change; life cycles of marine animals; planktons and food chains and the effects on population change; the application of ecological techniques to local problems; field survey and laboratory exercises

## 2. Number of hours per semester

Theory (hours)	Practice (hours)	Self-study (hours)
45	30	105

## 3. Number of Hours per Week for Individual Advice

Instructors provide academic counseling and guidance to individual upon request during office hour (Monday-Friday).

## General Course Structure

**Duration:** 2 online sessions and 6 on-site days

### Session 1: Preparation

### Session 2: Introduction to the ocean

*Topics to be covered:* global water budget, physical properties of the ocean, the effect of physical properties of the ocean on its dynamics (oceanic currents, salt transport, heat budget and transmission of energy)

### Session 3: Ocean motions

*Topics to be covered:* tides, waves, currents (barotropic (pressure-driven) and baroclinic (temperature and salinity driven) flows)

*Demonstrations and discussion:* current driven by pressure (demonstration and discussion), current driven by temperature gradient (classroom experiment)

### Session 4: Observing the ocean

*Measuring currents:* 1992 rubber duck toys (ocean drifters), 1990 Nike sneakers (ocean drifters), CFC tracers, remote sensing, gliders, Argo floats, etc.

### Session 5: Marine Biodiversity

*Topics to be covered:* Lecture and laboratory and field investigation on Marine plants and animals in the sea include Marine Macroalgae, Division Cyanophyta, Chlorophyta, Rhodophyta, Phaeophyceae; Seagrasses; Mangroves; and Marine animals; Phyla Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nemertea, Rotifera, Bryozoa, Phoronida, Brachiopoda, Sipunculida, Echiurida, Mollusca, Annelida, Arthropoda, Echinodermata, Chaetognatha, Hemichordata, Urochordata, Chordata)

### Session 6: Marine life

*Topics to be covered:* Introduction to Plankton, Nekton and Benthos and their environment, Food chain and Food web in the sea, Productivity in the sea

*Demonstrations and discussion:* laboratory on plankton

Session 7: Living Ocean

*Topics to be covered:* essential chemical and physical factors for marine life

*Demonstration and field study:* beach profiling, anatomy of a beach, modifying beaches (with breakwaters, jetties, groins), shallow water waves, sea water quality measurement

Session 8: Marine habitats

*Topics to be covered:* introduction to marine habitats such as sandy beach, muddy beach, rocky shore, seagrass beds, mangrove, coral reef, soft bottom

*Demonstration and field study:* distribution of marine organisms in sandy beach; vertical distribution and competition in rocky shore, marine organism adaptation in muddy shore, zonation and adaptation of plant in mangrove area, distribution of marine organisms in seagrass bed

Session 9: Aquarium management

*Topics to be covered:* introduction to marine aquarium biological and physical setups, optimal conditions for marine organisms in aquarium settings, aquarium food and waste management, introduction to aquaculture management

*Demonstration and field study:* hands on handling of coral and crown fish tanks as well as ray tank

Session 10: Marine algae for pharmaceuticals and cosmetics

*Topic to be covered:* survey of active ingredients and applications of marine algae extracts

*Demonstration and field study:* alcohol gel and soap preparation from seaweed extracts

Session 11: Marine environmental Issue and concern

*Topic to be covered:* rising sea level, ice melt, sewage effluent and toxicants, plastic trash, oil spill, red tide, heavy metals

Session 12: Turtle conservation

*Topic to be covered:* diversity, threats, and conservation of Thai sea turtles

*Demonstration and field study:* visit turtle exhibition, aquarium, and nursery at Sea Turtles Conservation Center Royal Thai Navy

Date/Time	Topic/Activity	Room/Field
<b>Online Session 1</b>	<b>June 1, 2021</b>	
09.00 – 10.30	Introduction and Orientation	Online
	Instructor: Dr. Pagkapol	
10.30 – 12.00	<u>Session 1</u> : Introduction to the ocean	Online
	Instructor: Dr. Arachaporn	
<b>Online Session 2</b>	<b>June 4, 2021</b>	
09.00 – 10.30	<u>Session 2</u> : Ocean motions	Online
	Instructor: Dr. Arachaporn	
10.30 – 12.00	<u>Session 3</u> : Observing the ocean	Online
	Instructor: Dr. Arachaporn	
<b>Day 1: Monday</b>	<b>TBA</b>	
10.00 – 10.30	Opening	BIMS
	Instructor: Director, Dr. Janjarus, Dr. Sumaitt, Dr. Arachaporn	
10.30 – 12.00	<u>Session 4</u> : Marine Biodiversity	BIMS
	Instructor: Dr. Sumaitt, Dr. Kitithorn	
12.00 – 13.00	Lunch	
13.00 – 15.00	Observing sandy, rocky, muddy and mangrove Area	Field
	Instructor: Dr. Janjarus, Dr. Sumaitt, Dr. Arachaporn	
15.00 – 16.30	Visit Oyster Factory: water and waste management	Field
	Instructor: Dr. Janjarus, Dr. Sumaitt, Dr. Arachaporn	
16.30 – 17.00	Discussion and Conclusion	
<b>Day 2: Tuesday</b>	<b>TBA</b>	
09.00 – 10.30	<u>Session 5</u> : Living Ocean	BIMS
	Instructor: Dr. Arachaporn, Environment Staff	
10.30 – 12.00	<u>Session 6A</u> : Marine life	BIMS
	Instructor: Dr. Sumaitt	
12.00 – 13.00	Lunch	
13.00 – 13.30	Field trip briefing	
14.00 – 16.00	<u>Session 5</u> : Living Ocean Practice - Beach Profiling, sandy beach, Sea water quality measurement	Field

	Instructor: Dr. Arachaporn, Dr. Sumaitt, Biodiversity staff	
	<u>Session 6</u> : Marine Life Practice - Plankton collecting	Field
	Instructor: Dr. Sumaitt, Biodiversity staff	
16.00 – 16.30	Back to BIMS	
16.30 – 17.00	Discussion and Conclusion	
<b>Day 3: Wednesday</b>	<b>TBA</b>	
09.00 – 10.30	<u>Session 7A</u> : Marine Habitats (intertidal zone)	BIMS
	Instructor: Dr. Sumaitt	
10.30 – 12.00	<u>Session 7B</u> : Marine habitats (coral reef ecosystem)	BIMS
	Instructor: Dr. Sumaitt	
12.00 – 13.00	Lunch	
13.00 – 14.00	<u>Session 6A</u> : Marine life (Plankton)	BIMS
	Instructor: Biodiversity staff	
14.00 – 16.30	Laboratory	BIMS
	- Plankton counting and diversity	
	- Sea water <i>Vibrio spp.</i> culture	
	- Antioxidant assay from algae culture	
	Instructor: BIMS staff	
16.30 – 17.00	Field trip briefing	BIMS
<b>Day 4: Thursday</b>	<b>TBA</b>	
07.00 – 9.00	Go to field trip (Sattahip district)	Field
09.00 – 11.00	<u>Session 7</u> : Marine habitats – Seagrass beds (Sattahip bay)	Field
	Instructor: Dr. Sumaitt, Dr. Arachaporn, Dr. Janjarus, Biodiversity staff	
11.00 – 12.00	Lunch/Go to field trip (Samaesarn Islands)	Field
12.30 – 15.30	<u>Session 7</u> : Marine habitats – Coral reef ecology at Samaesarn Islands	Field
	Instructor: Dr. Sumaitt, Dr. Arachaporn, Dr. Janjarus, Biodiversity staff	
15.30 – 17.30	Back to BIMS / Discussion and Conclusion on the Way	
<b>Day 5: Friday</b>	<b>TBA</b>	
09.00 – 10.00	<u>Session 8</u> : Aquatic Management	BIMS



	Instructor: BIMS staff	
10.00 – 10.45	BIMS Aquarium	BIMS Aquarium
10.45 – 12.00	BIMS Aquaculture Tank	BIMS Aquarium
12.00 – 13.00	Lunch	
13.00 – 14.15	<u>Session 9</u> : Marine algae for pharmaceuticals and cosmetics	BIMS
	Instructor: BIMS staff	
14.30 – 16.00	Laboratory	BIMS
	- Alcohol gel and soap preparation from seaweed extraction	
16.00 – 17.00	Student presentation preparation and consultation	BIMS
<b>Day 6: Saturday</b>	<b>TBA</b>	
09.00 – 10.30	<u>Session 10</u> : Marine environmental Issue and concern	
	Instructor: Dr. Arachaporn, Dr. Janjarus, Environment staff	BIMS
10.30 – 12.00	Report and Presentation on Marine Biodiversity Aspects	
	Instructor: Dr. Arachaporn, Dr. Janjarus, Environment staff	
12.00 – 12.30	Summary and Conclusion	BIMS
12.30 – 14.30	Lunch and Transport to Sattahip Naval Base	
14.30 – 17.00	<u>Session 11</u> : Sea Turtle Conservation	Field
	Field trip at Sea Turtles Conservation Center Royal Thai Navy	
	Instructor: Dr. Pagkapol	

## Measurement and Evaluation of learning achievement

### a. Formative assessment

During a lesson, instructor keeps the question going and monitors students' progress in general. There are also quizzes to check the current understanding of individual students.

### b. Summative assessment

(1) Tool and weight for measurement and evaluation

Learning Outcomes	Measurement Method			Weight (Percentage)
	Individual assignment	Group assignment	Report and Essay	
CLO1: Describe biological and physiological components of the ocean	10			10
CLO2: Identify common species found in the ocean	10			10
CLO3: Collect information, interpret data, and discuss the results		10	20	30
CLO4: Apply knowledge to suggest an approach to solve environmental problems of the ocean.		20	30	50
<b>Total</b>	<b>20</b>	<b>30</b>	<b>50</b>	<b>100</b>

(2) Measurement and evaluation

Performance of the students is evaluated and assessed according to course objectives and learning outcomes. Rubric scores for a single piece of individual work is illustrated below:

Score	Description
20	Demonstrates the required work for all questions.
16	Demonstrates the required work for most questions with lower than 25% mistakes.
12	Demonstrates the required work for many questions with lower than 50% mistakes.
8	Demonstrates the required work for some questions with more than 50% mistakes.

4	Demonstrates the required work for few questions with more than 75% mistakes.
0	No response

Evaluation and achievement will be justified according to Faculty and University code of conduct grading system of A, B+, B, C+, C, D+, D and F. Students will be evaluated based on the relative performance of the whole class; however, they must receive more than 80% to be qualified for an A. To pass this course, students must earn a grade of at least D.

(3) Re-examination (if the course allows any)

Re-examination is allowed only once in case of student obtain less than D grade.

**Cheating and plagiarism:** We have “0” tolerance for any forms of cheating and plagiarism. If you are not sure whether you are plagiarizing others. Please refer to the university bulletin or contact me prior to the submission of assignments.

### 3. Students' Appeal

Students may submit formal complaint or academic appeal directly to

International Education and Administration Unit, Division of Salaya Campus Room  
SC1-116, SC1-Building, Faculty of Science (Salaya Campus), Mahidol University 999  
Phuttamonthon 4 Road, A. Phuttamonthon, Nakhon Pathom 73170, Thailand E-mail:  
scsim@mahidol.ac.th; Phone: + 66 2 4419820 ext. 1199.

**Resources:**

- (Book) An introduction to the World's Ocean by Keith A. Sverdrup and E. Virginia Armbrust, McGraw-Hill
- (Video) Bernoulli's principle: relating pressure and speed of air  
<https://www.youtube.com/watch?v=FaQyUU8fWpg>
- 1992 rubber duck toy incident
  - <http://www.oldsaltblog.com/2014/05/friendly-floatees-what-29000-yellow-ducks-red-beavers-blue-turtles-and-green-frogs-tells-us-about-ocean-dumping/>
  - (Video) [https://www.youtube.com/watch?v=\\_UjAxuSuLlc&t=218s](https://www.youtube.com/watch?v=_UjAxuSuLlc&t=218s)
- 1990 Nike sneakers incident - [https://en.wikipedia.org/wiki/Hansa\\_Carrier](https://en.wikipedia.org/wiki/Hansa_Carrier)
- (Video) Argo floats - <https://www.youtube.com/watch?v=WGbanFvBX38>
- (Video) Broader introduction to physical oceanography: How do ocean currents work? - Jennifer Verduin - <https://www.youtube.com/watch?v=p4pWafuvdrY&t=117s>
- (Video) Plastic Ocean - [https://www.youtube.com/watch?v=ju\\_2NuK5O-E](https://www.youtube.com/watch?v=ju_2NuK5O-E)
- (Video) Sea level rise - <https://www.youtube.com/watch?v=hJPDyozOX3k>

Online Session 1	Online Session 2	1	2	3	4	5	6
Tues June 1	Fri June 4	Mon TBA	Tue TBA	Wed TBA	Thu TBA	Fri TBA	Sat TBA
		(Mahidol bus all day)					
Intro and Orientation	2. Ocean Motions	7:00 Leave Salaya for BIMS			7:00 Leave from the hotel (Restroom break at a gas station)		(Mahidol bus pick up at BIMS from noon) (Students check out of the hotel in the morning)
1. Intro to the Ocean	3. Observing the Ocean		9:00-10:20 5. Living Ocean	9:00-10:20 7A. Marine habitat (intertidal zone)	Visit seagrass bed (Sattahip bay)	9:00-10:00 8. Aquarium management	9:00-10:20 10. Marine environmental issue and concerns
		10:00 Opening	Break	Break		10:00-10:45 BIMS Aquarium visit	Break
		10:30-12:00 4. Marine Biodiversity (rocky and mangrove area)	10:30-12:00 6A. Marine Life (coral and sandy beach)	10:30-12:00 7B. Marine habitat (coral reef ecology)		10:45-12:00 BIMS Aquaculture	10:30-12:00 Presentation on Marine Biodiversity Aspect
		12:00 Lunch	12:00 Lunch	12:00 Lunch	11:00 Shuttle boat to Samae San Island	- Nemo handling	
		13:00 Field trip	13:00 Field trip briefing	13:00-14:00 6B. Marine Life (Plankton) (diversity, culture, extraction)	11:30 Lunch	- Ray tank / ray feeding	12:00 Lunch
		13:30-15:00 - Mangroove forest (Muangmai)	14:00 Field trip (Bangsaen beach)	14:00 Lab briefing	12:30 Snorkel equipment fitting		12:00 Summary and Conclusion
					13:00 Snorkel safety	13:00-14:15 9. Marine algae for phamarceuticals and cosmetics	
					13:30 Snorkeling Trip		
						14:30 Laboratory	14:30 Sea Turtles Conservation Center Royal Thai Navy
		15:00-16:30 - Oyster factory (culture, harvest, and waste management)	- Beach profiling - Plankton collection - Sea water quality - Water sampling bacterial culture	- Plankton counting and diversity - Water sample bacterial count - Antioxidant assay from algae cultu		-Alcohol gel and soap preparation by using seaweed or phytoplankton extraction	- Orientation - Exhibition - Turtle aquarium
		17:00 Check-in to the hotel	(Vibrio spp. in sea water)	17:00 Field trip briefing	16:00 Shuttle boat back	16:00 Presentation preparation/consultation	- Turtle nursery
					17:00 Leave for the hotel		17:00 Leave for Salaya