



**B O A R D O F S T U D I E S**  
NEW SOUTH WALES

# **Marine Studies**

**Content Endorsed Course**  
**Stage 6**

**Syllabus**



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# 1 The Higher School Certificate Program of Study

The purpose of the Higher School Certificate program of study is to:

- provide a curriculum structure which encourages students to complete secondary education;
- foster the intellectual, social and moral development of students, in particular developing their:
  - knowledge, skills, understanding and attitudes in the fields of study they choose
  - capacity to manage their own learning
  - desire to continue learning in formal or informal settings after school
  - capacity to work together with others
  - respect for the cultural diversity of Australian society;
- provide a flexible structure within which students can prepare for:
  - further education and training
  - employment
  - full and active participation as citizens;
- provide formal assessment and certification of students' achievements;
- provide a context within which schools also have the opportunity to foster students' physical and spiritual development.

## **2 Rationale for Marine Studies in Stage 6 Curriculum**

The oceans cover more than 70 per cent of the earth's surface and influence all forms of life on this planet. Of the thirty-three animal phyla, twenty-eight are found in the sea and thirteen are exclusively marine.

Internationally, the oceans are viewed alternately as areas rich in minerals and marine life which can supply our needs virtually without limit, or as repositories for agricultural, industrial and domestic waste. Nationally, the United Nations declaration of the Australian Exclusive Economic Zone in 1994 effectively doubled this country's size and responsibilities. Australia now controls an area of the oceans that is 1.3 times the size of its land mass.

At a time of pressure on the marine environment there is a recognised need to deliver sound marine educational programs through formal structures within state and national curricula. Australians must be aware of and understand this fragile environment, and consider how to effectively manage 69 630 km of coastline, 14.8 million square kilometres of continental shelf, 12 000 islands, 783 major estuaries and the life they contain.

Marine Studies provides an opportunity for the future custodians of this environment to study it and to appreciate its value. It gives them the opportunity to develop the necessary knowledge and skills to use and protect its unique ecosystems, and at the same time communicate their appreciation to the community. It provides an opportunity to instill in students an acceptable ethical code towards use of the marine environment, increasingly demanded by the community and their governments. While this course is focused on oceans, it provides scope for the study of the full range of waterways.

Marine Studies provides an educational context, linked to the needs of a population based very much on its coast and waterways and which fosters links to tertiary study and vocational pathways. Further, this syllabus brings a wide range of marine-based leisure experiences to students in a safe setting. Marine Studies provides for both practical and theoretical learning, honing students' acquired skills to solve real life problems.



### 3. Continuum of Learning for Students of Marine Studies Stage 6

Students of Marine Studies bring a range of K-10 and other life experiences as background to their study. The Content Endorsed Course structure enables the selection of modules that recognise and build upon students' knowledge, understandings and skills through further and more in-depth study of this area.

Marine Studies will support students in developing a commitment to and capacity for lifelong learning in this area. This may lead to further post-school study at University or TAFE or vocational training in the context of the workplace. Learning may also continue through ongoing life experiences as an area of personal interest.

In Marine Studies students may elect to undertake a course of study which covers a broad and diverse range of optional modules, or alternatively to specialise through a focus on thematic groups of modules which may provide a continuum into specific fields of post-school employment, study or leisure pursuits. Examples of these focused modular groupings may include:

<ul style="list-style-type: none"> <li>• A Marine Biology focus                             <ul style="list-style-type: none"> <li>– Dangerous Marine Creatures (module 3)</li> <li>– Coral Reef Ecology (module 6)</li> <li>– Anatomy and Physiology of Marine Organisms (module 14)</li> </ul> </li> <li>• A Fishing focus                             <ul style="list-style-type: none"> <li>– Dangerous Marine Creatures (module 3)</li> <li>– Commercial and Recreational Fishing (module 10)</li> <li>– Seafood Handling and Processing (module 15)</li> <li>– Marine Engineering (module 17)</li> </ul> </li> <li>• A Boating focus                             <ul style="list-style-type: none"> <li>– Boating and Seamanship (module 19)</li> <li>– Marine Craft Construction and Repair (module 20)</li> <li>– Pilotage and Navigation (module 21)</li> <li>– Marine Communication (module 22)</li> <li>– Wind Powered Craft (module 23)</li> </ul> </li> <li>• A Seafood Handling focus                             <ul style="list-style-type: none"> <li>– Commercial and Recreational Fishing (module 10)</li> <li>– Anatomy and Physiology of Marine Organisms (module 14)</li> <li>– Marine Engineering (module 17)</li> </ul> </li> <li>• A Diving focus                             <ul style="list-style-type: none"> <li>– Resuscitation Certificate (module 1)</li> <li>– First Aid Certificate (module 2)</li> <li>– Dangerous Marine Creatures (module 3)</li> <li>– Coral Reef Ecology (module 6)</li> <li>– Skin Diving and Diving Science (module 16)</li> <li>– Marine Archeology (module 18)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• A Leisure focus                             <ul style="list-style-type: none"> <li>– Resuscitation Certificate (module 1)</li> <li>– First Aid Certificate (module 2)</li> <li>– Sea Birds of Our Coast (module 9)</li> <li>– Skin Diving and Diving Science (module 16)</li> </ul> </li> <li>• An Oceanography focus                             <ul style="list-style-type: none"> <li>– Estuarine Studies (module 4)</li> <li>– Coastal Studies (module 5)</li> <li>– Oceanography (module 7)</li> <li>– Marine Engineering (module 17)</li> <li>– Marine Archeology (module 18)</li> </ul> </li> <li>• An Aquaculture focus                             <ul style="list-style-type: none"> <li>– Commercial and Recreational Fishing (module 10)</li> <li>– Aquaculture (module 11)</li> <li>– Anatomy and Physiology of Marine Organisms (module 14)</li> <li>– Seafood Handling and Processing (module 15)</li> </ul> </li> <li>• A Coastal Studies focus                             <ul style="list-style-type: none"> <li>– Estuarine Studies (module 4)</li> <li>– Coastal Studies (module 5)</li> <li>– Marine Resource Management (module 12)</li> <li>– Marine Engineering (module 17)</li> </ul> </li> <li>• A Marine Ecology focus                             <ul style="list-style-type: none"> <li>– Dangerous Marine Creatures (module 3)</li> <li>– Estuarine Studies (module 4)</li> <li>– Coastal Studies (module 5)</li> <li>– Coral Reef Ecology (module 6)</li> <li>– Oceanography (module 7)</li> <li>– Anatomy and Physiology of Marine Organisms (module 14)</li> </ul> </li> </ul>
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## **4. Aim**

The aim of Marine Studies Stage 6 is to develop in each student a capacity to think critically about key issues relating to the marine environment, to utilise and protect the resources it offers, and to develop skills that allow students to participate safely in a wide range of practical experiences.

## **5. Objectives**

Through the study of Marine Studies students will develop:

- knowledge, understanding and appreciation that will promote sound environmental practices in the marine environment
- the ability to cooperatively manage activities and communicate in a marine context
- an ability to apply the skills of critical thinking, research and analysis
- knowledge and understanding of marine industries and their interaction with society and with leisure pursuits
- knowledge, understanding and skills of safe practice in the marine context.

## 6 Course Structure

Marine Studies is comprised of a 30 hour Core, 23 optional modules and an optional personal interest project. After completing the core, schools are able to select from the optional modules to develop programs that respond to student needs and interests.

Schools may also develop a maximum of 15 hours of School Developed modules, for each 60 hours of study, within the guidelines described on page 91.

A range of courses may be offered as follows:

<b>Units and Years of Study</b>	<b>Number of Hours</b>	<b>Preliminary / HSC</b>	<b>Number of Modules</b>
1 unit / 1 year	60	60 hours Preliminary or 60 hours HSC	30 hour Core and 30 hours of optional modules
1 unit / 2 years	120	60 hours Preliminary plus 60 hours HSC	<i>Preliminary</i> 30 hour Core + 30 hours of optional modules; and <i>HSC</i> 60 hours of optional modules
2 units / 1 year	120	120 hours Preliminary or 120 hours HSC	30 hour Core and 90 hours of optional modules
2 units / 2 years	240	120 hours Preliminary plus 120 hours HSC	<i>Preliminary</i> 30 hour Core + 90 hours of optional modules; and <i>HSC</i> 120 hours of optional modules

## Core and Optional Modules

Core	Optional Modules	Hours
1. Marine Safety and First Aid (6 hours)	1 Resuscitation Certificate	15
	2 First Aid Certificate	15
	3 Dangerous Marine Creatures	30
	4 Estuarine Studies	30
	5 Coastal Studies	30
	6 Coral Reef Ecology	30
	7 Oceanography	15/30
2. The Marine Environment (6 hours)	8 Local Area Study	15
	9 Sea Birds of Our Coast	15
	10 Commercial and Recreational Fishing	30
	11 Aquaculture	15/30
	12 Marine Resource Management	15
3. Life in the Sea (6 hours)	13 Marine Aquarium	15/30
	14 Anatomy and Physiology of Marine Organisms	15/30
	15 Seafood Handling and Processing	30
4. Humans in Water (6 hours)	16 Skin Diving and Diving Science	30
	17 Marine Engineering	30
	18 Marine Archaeology	30
	19 Boating and Seamanship	30
	20 Marine Craft Construction and Repair	30
	21 Pilotage and Navigation	15/30
5. Marine and Maritime Employment (6 hours)	22 Marine Communication	30
	23 Wind Powered Craft	30
5. Marine and Maritime Employment (6 hours)	24 Personal Interest Project	30

## 7 Objectives and Outcomes

### 7.1 Table of Objectives and Outcomes

Objectives	Outcomes
<p>Students will develop:</p> <p>1. knowledge, understanding and appreciation that promote sound environmental practices in the marine environment</p>	<p>A student:</p> <p>1.1 relates with a respectful and caring attitude to the ocean and its life forms</p> <p>1.2 identifies the roles of individuals or groups involved in maritime activities</p> <p>1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course</p> <p>1.4 recognises Aboriginal and Torres Strait Islander values and attitudes towards the sea</p> <p>1.5 demonstrates an awareness of the value of the ocean as a source of historical information</p>
<p>2. the ability to manage activities cooperatively and communicate in a marine context</p>	<p>2.1 appreciates the importance of effective management practice</p> <p>2.2 works effectively within a group</p> <p>2.3 communicates information by writing reports, giving short talks and contributing to discussions</p>
<p>3. an ability to apply the skills of critical thinking, research and analysis</p>	<p>3.1 evaluates information, situations, equipment manuals and written or manual procedures</p> <p>3.2 collects and organises data by accurately reading instruments, signals and charts; by systematic recording, summarising, tabulating and graphing</p> <p>3.3 generates information from data by calculating, inferring, interpreting and generalising</p> <p>3.4 carries out planned research activities using appropriate measurements, observations, classification and recording skills</p>

<b>Objectives</b>	<b>Outcomes</b>
4. knowledge and understanding of marine industries and their interaction with society and with leisure pursuits	4.1 identifies marine vocations and a range of leisure pursuits 4.2 appreciates marine environments as sources of employment and leisure
5. knowledge, understanding and skills of safe practice in the marine context	5.1 values the rules and operating principles of marine equipment and applies them 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of the marine environment 5.3 interprets and follows instructions, with accuracy 5.4 selects, organises, assembles, dismantles, cleans, and returns equipment

Marine Studies Content Endorsed Course Stage 6 Syllabus

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Outcomes	Related Modules																												
	C 1	C 2	C3	C 4	C 5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1.1 relates with a respectful and caring attitude to the ocean and its life forms																													
1.2 identifies the roles of individuals or groups involved in maritime activities																													
1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course																													
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Marine Studies Content Endorsed Course Stage 6 Syllabus

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5.3 interprets and follows instructions, with accuracy																																
5.4 selects, organises, assembles, dismantles, cleans, and returns equipment																																



## **7.2 Key Competencies**

Marine Studies Stage 6 provides an extensive and unique range of stimulating contexts within which students will develop those competencies considered essential for further education, work and productive functioning as members of Australian society.

The following key competencies have been embedded in the Marine Studies Stage 6 Syllabus. These competencies are seen as essential components to enhance student learning and hence to the overall effectiveness of this syllabus.

### **Collecting, analysing and organising information**

This is developed through the syllabus' emphasis on critical thinking and research. Students are given ample scope and encouragement to research a range of information sources, discerning their relevance to particular marine issues. Skills of analysis are applied to explaining wise management of data and monitoring its effectiveness. This competency is seen as a core process of scientific enquiry required by all students.

### **Communicating ideas and information**

This competency is developed in all aspects of the syllabus. Students develop the capacity to select appropriate means to communicate relevant understandings to their peers and the wider community.

### **Planning and organising activities**

This competency is developed in contexts such as strategic planning for safe near-water and water activities, organising personal equipment for boating, fishing, snorkelling and SCUBA activities, notifying relevant authorities prior to departure and on return, and completing logbooks required by statutory bodies.

### **Working with others and in teams**

There are significant opportunities for students to work cooperatively and adopt leadership roles in the context of this syllabus. This competency is embedded in many of the optional modules and is essential to all the practical water-based modules. The 'buddy' system is a mandatory requirement for many activities in this syllabus.

### **Using mathematical ideas and techniques**

Students collect data from the marine environment, analyse statistical evidence, apply mathematical concepts, construct tables and graphs, and present their findings as meaningful reports. In the Optional modules students are required to use mathematical models, mathematical tables and relevant calculations to fix positions, determine currents and tides and establish repetitive-dive timing.

### **Using technology**

Research and investigation in this syllabus involves using appropriate information technologies. Students also examine technologies used by marine and maritime industries and through the Optional Modules are given the opportunity to use and gain recognised qualifications with the most up-to-date marine and maritime communication, navigation and monitoring systems available.

### **Solving problems**

The course involves the study of contemporary marine operational and environmental issues and problems. The syllabus requires students to examine options and consider ethical dimensions when proposing solutions to these problems.

## Core Module 1: Marine Safety and First Aid

**Indicative Hours: 6**

### Description

This module gives a basic introduction to Marine Safety and First Aid providing the knowledge and skills to complete this course without risk.

In this module students investigate the following questions:

- What are the priorities for assessment and management of first aid patients?
- How are basic injuries treated?
- How is CPR administered?
- What marine organisms present potential dangers to humans?
- How can potentially dangerous situations associated with marine work be managed?

### Outcomes

A student:

- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 2.1 appreciates the importance of effective management practice
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.2 collects and organises data by accurately reading instruments, signals and charts; by systematic recording, summarising, tabulating and graphing
- 5.1 values the rules and operating principles of marine equipment and applies them
- 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of the marine environment
- 5.3 interprets and follows instructions, with accuracy
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### Notes for Teachers

- It is anticipated that many students will complete an accredited First Aid and Resuscitation Certificate as part of this course. This satisfies the Outcomes for Core Module 1 and Optional Modules 1 and 2.
- It is recommended that First Aid and Resuscitation Certification be studied concurrently.
- Successful completion of any First Aid course approved by NSW Workcover Authority satisfies all outcomes of this module. These courses include:
  - St John Ambulance Australia First Aid Certificate
  - NSW Ambulance First Aid Certificate
  - DAN First Aid Certificate

## Core Module 1: Marine Safety and First Aid

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• priorities for assessment and management of first aid patients                             <ul style="list-style-type: none"> <li>– Danger, Response, Airway, Breathing, Compressions, Defibrillation (DRABCD) plan</li> <li>– Cardio Pulmonary Resuscitation (CPR)</li> <li>– structure of human airway and the processes involved in breathing</li> </ul> </li>   <li>– treatment of cuts and abrasions</li> <li>– managing simple injuries</li>   <li>• identification, prevention and management of dangers associated with marine environment                             <ul style="list-style-type: none"> <li>– <i>hypothermia</i></li> <li>– hyperventilation</li> <li>– heat exhaustion and heat stroke.</li> </ul> </li>   <li>• dangers associated with marine ecosystems including coral wounds, stings, bites, burns, scalds, sunburn, sprains, seasickness, shock</li>   <li>• first aid kits</li>   <li>• emergency services including                             <ul style="list-style-type: none"> <li>– ambulance</li> <li>– hospital</li> <li>– police</li> <li>– Poisons Information Centre</li> <li>– Dive Emergency Centre</li> <li>– Fire Brigade Emergency Centre</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• assess emergency situations and identify emergency priorities</li>   <li>• demonstrate the principles of CPR with one and two operators</li>   <li>• apply basic treatment for cuts and abrasions</li>   <li>• conduct appropriate treatment for a range of heat-related conditions</li>   <li>• identify and illustrate dangerous marine flora and fauna</li> <li>• assess and treat first aid situations in the marine environment.</li>   <li>• evaluate the components of a first aid kit</li>   <li>• initiate contact with emergency services, providing relevant information and providing support to maintain the patient.</li> </ul>

## **Core Module 2: The Marine Environment**

**Indicative Hours: 6**

### **Description**

This module gives a basic introduction to the Marine Environment, considering its chemical and physical make-up and how they impact on marine life.

This module also briefly considers how the atmosphere above affects the environment and the organisms that live in it.

Students investigate the following questions:

- What are the features of the Marine Environment?
- How can the Marine Environment be altered by the changes in the atmosphere?
- How do humans investigate and monitor this environment?

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 1.5 demonstrates an awareness of the value of the ocean as a source of historical information
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 3.4 carries out planned research activities using appropriate measurements, observations, classification and recording skill.
- 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of Marine Environment
- 5.3 interprets and follows instructions, with accuracy

### **Notes to teachers**

Sound ethics of minimal environmental impact should be instilled in students during this core module. Teaching practices should be selected to demonstrate this principle.

## Core Module 2: The Marine Environment

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• environmental features that sustain life                             <ul style="list-style-type: none"> <li>– humidity</li> <li>– rainfall</li> <li>– vaporation</li> <li>– temperature</li> <li>– light</li> <li>– gas types and distribution</li> <li>– types of salt</li> </ul> </li> <li>• the physical and chemical properties of sea water</li> <li>• the effects of physical and chemical properties including:                             <ul style="list-style-type: none"> <li>– water movement in the marine environment as ocean currents, tides, river flows, and waves</li> <li>– the effects of water in relation to mixing, distributing nutrient and carrying plankton.</li> </ul> </li> <li>• water movements in the marine environment                             <ul style="list-style-type: none"> <li>– tides</li> <li>– currents</li> </ul> </li> <li>• weather over water                             <ul style="list-style-type: none"> <li>– predicting weather</li> <li>– effects of weather on marine environments</li> </ul> </li> <li>• obtaining and using information related to the marine environment</li> </ul>	<ul style="list-style-type: none"> <li>• describe the environmental factors in the maintenance of marine life</li> <li>• investigate and test the physical and chemical properties of sea water</li> <li>• explain the effects of water movement on marine organisms</li> <li>• interpret tide charts</li> <li>• identify currents on marine charts</li> <li>• plot the major ocean currents</li> <li>• predict weather patterns using synoptic charts, broadcasts and observation</li> <li>• observe and interpret weather over water</li> <li>• explain how weather affects the marine environment</li> <li>• use a variety of sources to obtain information about the marine environment.</li> </ul>

## **Core Module 3: Life in the Sea**

**Indicative Hours: 6**

### **Description**

This module introduces students to the enormous diversity of life found in the sea. It makes students aware of the fact that twenty-eight of the thirty-three animal phyla found on earth are found in the sea.

The module investigates the concepts of adaptation and inter-relationships within marine ecosystems.

Students investigate the following questions:

- How diverse are life forms in the sea?
- Why are there so many phyla found in the sea?
- What interrelationships exist between organisms in marine ecosystems?

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 3.2 collects and organises data by accurately reading instruments, signals and charts, and systematically recording, summarising, tabulating and graphing
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 3.4 carries out planned research activities using appropriate measurement, observation, classification and recording skills
- 5.3 interprets and follows instructions, with accuracy

### **Notes to teachers**

This unit would be enhanced by an excursion to a diverse marine ecosystem.

## Core Module 3: Life in the Sea

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• diversity of living things found in the sea</li> <li>• classification groups of all ocean life forms                             <ul style="list-style-type: none"> <li>– plankton (drifters and floaters)</li> <li>– nekton (free swimmers)</li> <li>– benthos (encompasses all bottom dwellers whether in shallow water off the coast or in the depths of the ocean)</li> </ul> </li> <li>• an organism’s adaptations to its immediate environment</li> <li>• specific roles of marine life                             <ul style="list-style-type: none"> <li>– producer</li> <li>– consumer</li> <li>– decomposer</li> </ul> </li> <li>• food chains, food webs and food pyramids found in the sea</li> <li>• the relationship between where organisms are found, their adaptation and the physical environment</li> </ul>	<ul style="list-style-type: none"> <li>• compare the diversity and abundance of ocean life to that of terrestrial life</li> <li>• classify examples of ocean life</li> <li>• discuss the differences between classification groups in terms of their structure and needs</li> <li>• identify, explain and draw food chains and food webs for marine ecosystems</li> <li>• describe how an organism needs to adapt to its physical environment</li> </ul>



## Core Module 4: Humans in Water

**Indicative Hours: 6**

### Description

The module is designed to provide an insight into the problems facing humans as they enter water, and to provide practical means of overcoming the limitations of human systems in this foreign environment.

Students investigate the following questions:

- How does water affect humans?
- How does man overcome these effects?
- What skills can be learned to survive in and enjoy the marine environment?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies with the roles of individuals or groups involved in maritime activities
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 2.2 works effectively within a group
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.3 collects and organises data by accurately reading instruments, signals and charts, and systematically recording, summarising, tabulating and graphing
- 4.1 identifies marine vocations and a range of leisure pursuits
- 5.3 interprets and follows instructions, with accuracy
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### Notes to teachers

- Completion of a log book of skills is required in this module.
- This module meets safety requirements required for the study of specific Optional Modules.
- Refer to the safety guidelines in the DET handbook *Guidelines for the Safe Conduct of Sport and Physical Activity in Schools*.
- Successful completion of a recognised Bronze Medallion qualification meets many of the outcomes of this module. Accepted qualifications include:
  - Royal Life Saving Society Bronze Medallion
  - Surf Life Saving Bronze Medallion

## Core Module 4: Humans in Water

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• how water affects humans                             <ul style="list-style-type: none"> <li>– seeing</li> <li>– breathing</li> <li>– hearing</li> <li>– movement</li> <li>– the effect of water on human skin</li> </ul> </li> <li>• contrast buoyancy in water and in air</li> <li>• the measures humans have taken to overcome the limitations water places on them including                             <ul style="list-style-type: none"> <li>– breathing and rebreathing equipment</li> <li>– face masks</li> <li>– wet suits</li> <li>– dry suits</li> </ul> </li> <li>• the factors affecting human movements and survival in water</li> <li>• survival swimming</li> <li>• distance swimming in a limited time</li> <li>• swimming with a snorkel, mask and fins</li> <li>• how humans move in water including the strokes used to propel humans in water</li> <li>• how Aboriginal peoples moved in water</li> </ul>	<ul style="list-style-type: none"> <li>• experience and draw conclusions about the effects of water on the senses and on movement.</li> <li>• adjust buoyancy on a personal level and in their machines</li> <li>• demonstrate how snorkels, rebreathing apparatus and scuba equipment are used to breathe under water</li> <li>• describe the effects on humans of rapid heat loss to the surrounding water</li> <li>• use wet or dry suits to prevent heat loss</li> <li>• stay afloat, unassisted for at least 10 minutes using survival swimming techniques — floating, treading water, bobbing etc</li> <li>• maintain continuous swimming for 200 metres in under 5 minutes</li> <li>• fin for a short distance on the surface using snorkel only</li> <li>• snorkel continuously for 200 metres on the surface without lifting the head</li> </ul>

## **Core Module 5: Marine and Maritime Employment**

**Indicative Hours: 6**

### **Description**

Ultimately Marine Studies students will enter the workforce. This strand has been designed to introduce students to the wide range of employment opportunities offered by marine and maritime industries.

Students investigate the following questions:

- What career opportunities are there in marine and maritime industries?
- What are the educational/training prerequisites required for these positions?

### **Outcomes**

A student:

- 1.2 identifies with the roles of individuals or groups involved in maritime activities
- 2.1 appreciates the importance of effective management practice
- 2.2 works effectively within a group
- 4.1 identifies marine vocations and a range of leisure pursuits
- 4.2 appreciates marine environments as sources of employment and leisure

### **Notes to teachers**

- Close liaison with careers advisers and local employment agencies is advised to provide students with up to date and accurate information.
- Tertiary institutions offering marine/maritime courses produce materials relating to post-course careers.

## Core Module 5: Marine and Maritime Employment

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• marine employment opportunities                             <ul style="list-style-type: none"> <li>• types of employment</li> <li>• entry requirements</li> </ul> </li>   <li>• maritime employment opportunities</li>   <li>• education/training standards required for selection</li>   <li>• post-school training details for the positions</li>   <li>• advantages and disadvantages of shore and sea-based careers</li>   <li>• features prospective employers may require in applicants</li>   <li>• scholarships and traineeships available in the marine and maritime fields</li> </ul>	<ul style="list-style-type: none"> <li>• investigate career opportunities in the marine and maritime industries</li>   <li>• assess personal characteristics and traits in relation to the requirements of prospective employers</li>   <li>• research the scholarships and traineeships that are available in the marine and maritime fields</li>   <li>• research training requirements, working conditions, rates of pay, hours of work for sea-going and shore-based positions</li>   <li>• recognise the shore-based support services provided by freight forwarders caterers, communicators, technicians, etc</li>   <li>• locate advertisements for sea and shore-based positions in local and national press</li> </ul>

## Optional Module 1: Resuscitation Certificate

**Indicative Hours: 15**

### Description

This optional module provides the opportunity for students to learn the theory and practice of Cardiopulmonary Resuscitation (CPR). After completing this module students should be competent to deliver EAR and CPR.

In this module students investigate the following questions:

- How do humans breathe?
- How can a non-breathing human be resuscitated?
- How can a human who is not breathing and whose heart has stopped be resuscitated?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms.
- 2.2 works effectively within a group
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.2 collects and organises data by accurately reading instruments, signals and charts; by systematic recording, summarising, tabulating and graphing
- 4.2 appreciates marine environments as sources of employment and leisure
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### Notes to Teachers

- Students should have the opportunity to attain a recognised Resuscitation Certificate in this module.
- It is anticipated that many students will complete an accredited First Aid and Resuscitation Certificate as part of this course. This satisfies the Outcomes for Core Strand 1 and Optional Modules 1 and 2.
- If Optional Module 1 is studied without optional Module 2, then only the Resuscitation Outcomes will be covered for Core strand 1.
- It is recommended that First Aid and Resuscitation Certification be studied concurrently.
- Successful completion of any First Aid course approved by NSW Workcover Authority satisfies all outcomes of this module. These courses include:
  - St John Ambulance Australia First Aid Certificate
  - NSW Ambulance First Aid Certificate
  - DAN First Aid Certificate
  - Royal Life Saving and Surf Life Saving qualifications

## Optional Module 1: Resuscitation Certificate

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• the theory of breathing                             <ul style="list-style-type: none"> <li>– parts of the respiratory system</li> <li>– operation of the respiratory system</li> </ul> </li> <li>• DRABCD and radial, carotid, and brachial pulse</li> <li>• Cardio Pulmonary Resuscitation                             <ul style="list-style-type: none"> <li>– external cardiac compression</li> <li>– rates of CPR on an adult, infants and children with one and two operators</li> </ul> </li> <li>• appropriate action for casualty who vomits or regurgitates including                             <ul style="list-style-type: none"> <li>– the lateral position and backward head tilt and jaw support</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• recognise and identify components of the respiratory system</li> <li>• apply primary survey and demonstrate the application of Danger, Response, Airways, Breathing, Compressions, Defibrillation (DRABCD)</li> <li>• assess radial, carotid, and brachial pulse</li> <li>• demonstrate appropriate CPR procedure depending on size of casualty and number of operators</li> <li>• perform one operator CPR and demonstrate the ability to instruct an untrained bystander to take the External Cardiac Compression (ECC) role</li> <li>• demonstrate the appropriate action for a casualty who vomits or regurgitates</li> </ul>

## Optional Module 2: First Aid Certificate

**Indicative Hours: 15**

### **Description**

This module aims to teach students the basic principles of first aid. It seeks to develop a degree of competence in them that would allow sound treatment of injury should they be the first person called to provide assistance.

Students should be given the opportunity to gain First Aid accreditation through WorkCover-registered courses as part of or in place of this module.

Students investigate the following questions:

- How do first aiders set priorities for treatment?
- How are crises managed?
- How are injuries managed?
- How are specific medical conditions treated?
- How is cross infection prevented?
- What are some legal and moral dilemmas facing first aiders?

### **Module Outcomes**

A student:

- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.2 collects and organises data by accurately reading instruments, signals and charts; by systematic recording, summarising, tabulating and graphing
- 5.4. selects, organises, assembles, dismantles, cleans and returns equipment

### **Notes to teachers**

- The module should be presented in such a way that all students have the opportunity to gain First Aid Accreditation.
- Extension work should be strongly geared towards managing marine accidents.
- It is recognised that not all students will want to gain First Aid accreditation. The module is designed to be taught by teachers to these students or be substituted by a nationally recognised First Aid Certificate that would include First Aid and Resuscitation (Modules 1 and 2).
- Successful completion of any First Aid course approved by NSW WorkCover Authority satisfies all outcomes of this module. These courses include:
  - St John Ambulance Australia First Aid Certificate
  - NSW Ambulance First Aid Certificate
  - DAN First Aid Certificate

## Optional Module 2: First Aid Certificate

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• setting priorities for managing a first aid situation and assessing the casualty                             <ul style="list-style-type: none"> <li>• situational analysis</li> <li>• approaching the casualty</li> <li>• priority assessment and management procedures</li> <li>• DRABC (Danger, Response, Airways, Breathing, Circulation)</li> <li>• STOP (Stop, Talk, Observe, Prevent further injury)</li> <li>• Whole of body assessment</li> </ul> </li> <li>• crisis management                             <ul style="list-style-type: none"> <li>– Expired Air Resuscitation (EAR)</li> <li>– Cardio Pulmonary Resuscitation (CPR)</li> <li>– bleeding</li> <li>– shock</li> <li>– neck and spinal injury</li> <li>– moving the casualty</li> <li>– medical referral</li> <li>– care of the unconscious casualty</li> </ul> </li> <li>• management and treatment of injuries</li> <li>• injuries                             <ul style="list-style-type: none"> <li>– wounds</li> <li>– fractures</li> <li>– dislocations</li> <li>– head injuries and concussion</li> <li>– eye injuries</li> <li>– burn injuries</li> <li>– teeth injuries</li> <li>– electrocution</li> <li>– cramps</li> <li>– chest injuries</li> <li>– abdominal injuries</li> </ul> </li> <li>• methods of treatment                             <ul style="list-style-type: none"> <li>– bandages</li> <li>– splints</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• conduct appropriate assessment procedures in response to a range of first aid scenarios</li> <li>• plan the overall management of a first aid situation and communicate strategies to other people at the scene</li> <li>• determine appropriate procedures for crisis management</li> <li>• use safe procedures when moving a simulated casualty</li> <li>• determine the appropriate EAR and CPR procedures depending on size of casualty and number of operators and demonstrate these procedures using a mannequin</li> <li>• identify signs and symptoms associated with each injury or condition</li> <li>• apply primary management techniques for each listed injury and condition</li> <li>• apply bandages and splints appropriately in the treatment of particular injuries</li> <li>• demonstrate the application of the following types of slings: collar and cuff, elevation and arm</li> <li>• explain the nature of each listed medical condition</li> <li>• analyse symptoms and signs of the listed medical conditions to determine</li> </ul>



<ul style="list-style-type: none"> <li>• management of medical conditions             <ul style="list-style-type: none"> <li>– heart attack</li> <li>– stroke</li> <li>– diabetes</li> <li>– epilepsy</li> <li>– asthma</li> <li>– poisoning</li> <li>– bites and stings</li> <li>– exposure to heat and cold</li> <li>– grand mal vs petit mal</li> <li>– hyperglycaemia vs hypoglycaemia</li> </ul> </li> <li>• physical environment</li> <li>• traffic accidents</li> <li>• water environment</li> <li>• electricity</li> <li>• infection control and protection             <ul style="list-style-type: none"> <li>– HIV/AIDS</li> <li>– Blood-borne viruses (Hepatitis B and C)</li> <li>– various policies and practices for infection control, and their importance</li> </ul> </li> <li>• legal and moral dilemmas             <ul style="list-style-type: none"> <li>– legal implications, eg occupational health and safety legislation, litigation</li> <li>– moral obligations, eg duty of care, responsible citizenship</li> <li>– commonsense versus heroics</li> </ul> </li> <li>• support following first aid situations             <ul style="list-style-type: none"> <li>– debriefing</li> <li>– counselling</li> <li>– available sources of support for emergency personnel</li> </ul> </li> </ul>	<p>listed medical conditions to determine the type, degree, and condition</p> <ul style="list-style-type: none"> <li>• analyse the safety issues associated with a range of physical environments</li> <li>• develop self-protective strategies that should be observed for a range of environments</li> <li>• describe the infection control procedures to follow in the event of an individual coming in contact with potentially infected body fluids</li> <li>• debate the legal and moral dilemmas associated with providing first aid</li> <li>• distinguish between a manageable first aid situation and an emergency situation</li> <li>• Identify first aid situations where follow-up support may be necessary for emergency service personnel</li> </ul>
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## **Optional Module 3: Dangerous Marine Creatures**

**Indicative Hours: 30**

### **Description**

In this optional module students are introduced to a range of dangerous marine creatures that may be encountered during the course. The module aims to teach students how to avoid these organisms to minimise the chance of injury and how to apply basic first aid specific to the injuries caused by each dangerous plant or animal.

Students investigate the following questions:

- How are dangerous organisms grouped?
- How do they affect humans?
- How can they be recognised?
- How can they be avoided?
- What can be done if contact is made with them?

### **Module Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 2.1 appreciates the importance of effective management practice
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### **Notes to Teachers**

- A wide range of websites relating to this module is available on the internet.
- The importance of avoidance should be stressed during this unit.
- Students should be made aware that many animals are not dangerous if left alone and that irritating seemingly harmless and docile animals often leads to attack.

## Optional Module 3: Dangerous Marine Creatures

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• dangerous marine organisms                             <ul style="list-style-type: none"> <li>– major classifications</li> <li>– habitat</li> <li>– effects on humans</li> </ul> </li> <li>• first-aid procedures to be followed for                             <ul style="list-style-type: none"> <li>– puncture wounds with venom</li> <li>– marine stings</li> <li>– marine bites</li> </ul> </li> <li>• recognising that marine organisms may                             <ul style="list-style-type: none"> <li>– puncture</li> <li>– bite</li> <li>– sting</li> </ul> </li> <li>• the marine environment and its resemblance to interstitial fluids as a suitable incubation medium and habitat for micro-organisms</li> <li>• dangerous entry and exit points</li> <li>• treatment of abrasions and removal of foreign material from coral or oyster cuts</li> <li>• the appearance of and identification of                             <ul style="list-style-type: none"> <li>– butterfly cod</li> <li>– stingrays</li> <li>– bullrouths</li> <li>– stonefish</li> <li>– cone shells</li> <li>– sea urchins</li> <li>– jellyfish</li> <li>– bluebottles</li> <li>– box jellyfish</li> <li>– stinging hydroids</li> <li>– corals</li> <li>– sea snakes</li> <li>– blue-ringed octopus</li> </ul> </li> <li>• Basic avoidance techniques for preventing attack by a dangerous marine creature</li> </ul>	<ul style="list-style-type: none"> <li>• recognise examples of dangerous marine organisms and their characteristics</li> <li>• demonstrate first aid procedures for dangerous marine organism wounds</li> <li>• identify the organisms that are dangerous</li> <li>• identify the marine organisms that live in cuts and abrasions (eg vibrio)</li> <li>• plan for alternative exit points if conditions change</li> <li>• practice basic avoidance techniques in relation to injury and infection</li> </ul>

## Optional Module 4: Estuarine Studies

**Indicative hours: 30**

### **Description**

This optional module gives students the opportunity to study the important areas where salt and freshwater meet – the estuaries. It is an ideal change to explore the unique ecosystems found in our 783 estuarine systems.

This module emphasises the importance of these systems to all species that live in the ocean and explores some of the pressures placed on them and the problems caused to them by human populations who choose to live on their banks and use their waters.

Students investigate the following questions:

- What is an estuary?
- Why are estuaries important?
- What ecosystems are present in estuaries?
- How can estuaries be managed to protect them and at the same time allow human use?
- What techniques can be used to sample estuarine ecosystems?

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 2.1 appreciates the importance of effective management practice
- 2.2 works effectively within a group
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.3 generates information from data by calculating, inferring, interpreting and generalising

### **Notes to teachers**

- NSW Department of Fisheries has extensive maps of NSW Estuaries and publications on the species present in and the importance of estuaries.
- Local government Statutory Bodies (Public Works, Flood Mitigation, NSW Waterways) and controlling Shire Councils also have invaluable information on NSW estuarine systems.

## Optional Module 4: Estuarine Studies

Students learn about :	Students learn to:
<ul style="list-style-type: none"> <li>• nature of an estuary                             <ul style="list-style-type: none"> <li>– merging of salt and fresh water</li> <li>– main ecosystems present — open river, seagrass beds, tidal mudflats, mangrove and salt-water grass and mud lands</li> <li>– lifeform adaptations to the estuarine environment</li> <li>– estuaries as sources of food for marine organisms and as nurseries for many species of fish and crustaceans</li> </ul> </li> <li>• the effects on estuaries of                             <ul style="list-style-type: none"> <li>– urban and agricultural runoff</li> <li>– amateur and professional fishing</li> <li>– recreational activities</li> <li>– reclamation for development</li> <li>– flood mitigation and training wall construction</li> </ul> </li> <li>• suitable management practices that will protect estuarine environments</li> <li>• common techniques used to sample marine life in a estuary</li> <li>• estuary life                             <ul style="list-style-type: none"> <li>– common mangrove species</li> <li>– common crustaceans</li> <li>– fish found in estuaries</li> </ul> </li> <li>• importance of estuaries</li> <li>• ecosystems present in estuaries                             <ul style="list-style-type: none"> <li>– techniques used to sample estuarine ecosystems</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• explain why estuaries are called ‘Supermarkets of the Sea’</li> <li>• construct an estuarine food web</li> <li>• identify and discuss the pressure being placed on estuaries due to human activities and structures</li> <li>• propose actions to reduce the impact of settlement on estuary environments</li> <li>• demonstrate common techniques used to sample marine life in an estuary</li> <li>• map the features of a local estuary including ecosystems present</li> <li>• extract animal life from mangrove mud (using sieves) to identify and analyse estuary life</li> <li>• use a microscope to look for plankton and other microscopic life forms in river water</li> <li>• locate the special adaptive features of mangrove trees</li> <li>• test mangrove mud for the presence of sulfide ions (S<sub>2</sub>)</li> <li>• determine the salinity of river water</li> <li>• measure the tidal range</li> <li>• monitor water conditions</li> <li>• construct a simple hand net to catch organisms in a current</li> </ul>

## Optional Module 5: Coastal Studies

**Indicative Hours: 30**

### **Description**

This optional module allows students to investigate the interface between the terrestrial and marine environments. It considers the various types of coastlines and investigates the forces that shape and change them. This module provides an ideal opportunity for students to investigate and assess the impact of humans on coastal regions.

Students investigate the following questions:

- What are coastlines?
- What are the forces that continually change coastlines?
- How has man impacted on these areas?
- How can these coastal areas be managed?

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.2 collects and organises data by accurately reading instruments, signals and charts; by systematic recording, summarising, tabulating and graphing.
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### **Notes to teachers**

- As far as possible this unit should be completed in the field.
- Outdoor or recreation guidelines for school systems (such as the D.E.T handbook *Guidelines for the Safe Conduct of Sport and Physical Activity in Schools* 1999) should be used if applicable.

## Optional Module 5: Coastal Studies

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• the nature and formation of coastline                             <ul style="list-style-type: none"> <li>– beach sand deposition</li> <li>– erosion including wind transport, water transport, human-related</li> </ul> </li>   <li>• ocean-related energy transfer systems                             <ul style="list-style-type: none"> <li>– physical characteristics of waves</li> <li>– mathematics of wave motion</li> <li>– effects of weather on wave generation</li> <li>– principles of tidal movement</li> <li>– refraction, reflection and diffraction of ocean waves</li> <li>– weather systems which affect our coastlines</li> </ul> </li>   <li>• different types of coastline                             <ul style="list-style-type: none"> <li>– the origin of coastal features</li> <li>– the features of a local coastal region</li> <li>– the constituents of common Australian beach sands</li> <li>– the geologic origins of local coastal rock</li> </ul> </li>   <li>• human impact on the natural coastal dynamics including                             <ul style="list-style-type: none"> <li>– training walls and other engineering structures</li> <li>– changing the flow of rivers</li> <li>– constructing sand by-pass systems</li> <li>– developing canal and beachfront estates</li> <li>– constructing high-rise buildings in coastal regions</li> <li>– using oceans to dump human waste</li> </ul> </li>   <li>• the importance of sand dunes and mangroves in providing a ‘buffer zone’</li> </ul>	<ul style="list-style-type: none"> <li>• describe the major processes responsible for beach sand deposition</li>   <li>• locate the origins of major ocean and inshore currents</li> <li>• interpret local wave and current patterns</li> <li>• discuss the principles of tidal flow</li> <li>• measure and record waves, currents and tides</li> <li>• manipulate wave-related mathematical formulae</li> <li>• recognise and define refraction, reflection and diffraction of ocean waves</li>   <li>• identify the different types of coastlines found around Australia</li> <li>• graph and compare the constituents of common Australian beach sands</li>   <li>• identify different methods of beach nourishment and replenishment</li>   <li>• evaluate coastal developments in terms of the impact on the environment</li>   <li>• locate sources of erosion and deposition of sand</li> <li>• identify the major sand-dune plants of a local beach</li> </ul>

<ul style="list-style-type: none"><li>● coastal management<ul style="list-style-type: none"><li>– local and national coastal protection legislation</li><li>– coastal zone management legislation</li><li>– the role of government in managing our coastlines effectively. List some groups which assist or hinder the management process</li><li>– evidence of human alteration of a coastal land form</li><li>– local coastal issues</li></ul></li></ul>	<ul style="list-style-type: none"><li>● discuss the changing attitudes of people towards their coastal environment</li><li>● investigate recent community management issues relating to a particular coastal zone</li><li>● compile a beach profile</li><li>● propose management procedures for a coastal management issue</li></ul>
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## Optional Module 6: Coral Reef Ecology

**Indicative Hours: 30**

### Description

This optional module introduces students to the most biodiverse of all marine ecosystems – the coral reef. It explores the distribution, formation and some of the complex interrelationships that exist within coral reef communities. It provides an ideal opportunity for students to complete their study on site in Australia's Great Barrier Reef Marine Park.

In this module students investigate the following questions:

- What are coral reefs?
- How are they formed?
- What are some of the interrelationships that exist on coral reefs?
- Why are coral reefs important?
- What are some of the threats to coral reefs?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 1.4 demonstrates an awareness of the value of the ocean as a source of historical information
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.2 collects and organises data by accurately reading instruments, signals and charts; by systematic recording, summarising, tabulating and graphing
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 3.4 carries out planned research activities using appropriate measurements, observations, classification and recording skills
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### Notes to teachers

- There are numerous publications, educational resources and excursion venues available for schools such as the Great Barrier Reef Marine Park Authority in Townsville.
- Queensland Department of Heritage issues educational permits for study groups within the marine parks of Queensland.
- World Resource Institute, International Centre for Living Aquatic Resources Management (ICLARM), World Conservation Monitoring Centre and the United Nations Environment Programme are all good sources for information on the threats to coral reefs world-wide.

## Optional Module 6: Coral Reef Ecology

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• coral organisms                             <ul style="list-style-type: none"> <li>– the structure of a coral polyp</li> <li>– the importance of zooxanthellae to coral polyps</li> <li>– depositing of calcium carbonate</li> </ul> </li> <li>• requirements and conditions for coral</li> <li>• types of coral                             <ul style="list-style-type: none"> <li>– reef-building corals</li> <li>– soft corals</li> </ul> </li> <li>• coral reef formation                             <ul style="list-style-type: none"> <li>– requirements and conditions for coral growth</li> <li>– impact of requirements on where coral reefs are found</li> </ul> </li> <li>• types of reefs                             <ul style="list-style-type: none"> <li>– barrier</li> <li>– coral cay</li> <li>– fringing</li> <li>– atoll</li> </ul> </li> <li>• interrelationships found on coral reefs                             <ul style="list-style-type: none"> <li>– plants and animals found in reefs</li> <li>– classification – producers, consumers, decomposers</li> <li>– species relationships – parasitism, commensalism, symbiosis</li> </ul> </li> <li>• importance of coral reefs                             <ul style="list-style-type: none"> <li>– sources of food</li> <li>– store of biodiversity</li> <li>– sites for recreation</li> <li>– natural coastline protection barriers</li> </ul> </li> <li>• threats to coral reefs including                             <ul style="list-style-type: none"> <li>– overexploitation,</li> <li>– destructive fishing techniques</li> <li>– pollution</li> <li>– global climate change</li> <li>– crown of thorn star fish</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• locate the major coral reef areas on a world map</li> <li>• identify the features of a typical coral reef</li>   <li>• distinguish between the various types of reefs</li>   <li>• identify and classify a selection of plants and animals species found on coral reefs</li> <li>• construct a coral reef food web</li> <li>• investigate special relationships of parasitism, commensalism and symbiosis on a coral reef</li> </ul>

<ul style="list-style-type: none"><li>• need for sound management and protection of coral</li></ul>	<ul style="list-style-type: none"><li>• research the management policies to protect coral reefs</li></ul>
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## Optional Module 7: Oceanography

**Indicative Hours: 15/30**

### Description

This optional module introduces students to the theory and practice of oceanography. It makes them aware of the nature and scope of this science through a series of simple practical experiences in the field. The emphasis in this module is on the development of measuring and datalogging skills relative to oceanography. Extension of skills and the addition of mapping skills develops this module to 30 hours.

Students investigate the following questions:

- What is oceanography?
- What methods are used by oceanographers?
- How do the structures found in the ocean compare to those found on land?
- What are the forces that make water move?
- What qualifications do students need to become oceanographers?

### Outcomes

A student:

- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 1.5 demonstrates an awareness of the value of the ocean as a source of historical information
- 2.1 appreciates the importance of effective management practice
- 2.2 works effectively within a group
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.2 collects and organises data by accurately reading instruments, signals and charts, and systematically recording, summarising, tabulating and graphing
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 4.1 identifies marine vocations and a range of leisure pursuits
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### Notes To Teachers

- This module may be enhanced by the use of “oceanographers for the day” programs/excursions which are commonly available and which provide practical activities.
- Liaison with Science Departments and the use of data loggers will provide practical activities for this unit.

## Optional Module 7: Oceanography

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• the nature and scope of oceanography                             <ul style="list-style-type: none"> <li>– oceanography is the quantitative study of the sea</li> <li>– it is carried out on site by scientists who make observations from floating laboratories</li> </ul> </li> <li>• methods used by oceanographers to measure                             <ul style="list-style-type: none"> <li>– depth</li> <li>– surface current speed</li> <li>– tidal flow</li> <li>– sound</li> <li>– sub-surface current speed and direction</li> <li>– water temperature</li> <li>– sediment transport</li> <li>– surface current direction</li> </ul> </li> <li>• methods oceanographers use to sample                             <ul style="list-style-type: none"> <li>– bottom sediments</li> <li>– plankton</li> <li>– water at different depths</li> <li>– night life</li> </ul> </li> <li>• constructing and using simple apparatus that can be used to measure the physical features of the ocean</li> <li>• structures of the oceans and their relationship to land</li> </ul>	<ul style="list-style-type: none"> <li>• list the three lobes of oceanography                             <ul style="list-style-type: none"> <li>– chemical oceanography</li> <li>– biological oceanography</li> <li>– physical oceanography</li> </ul> </li> <li>• select and use appropriate oceanography methods to research an aspect of the ocean</li> <li>• undertake appropriate sampling tests for a given research task</li> <li>• construct and use                             <ul style="list-style-type: none"> <li>– a sounding line to determine water depth</li> <li>– a Secchi disc to test water clarity</li> <li>– a simple bottom sediment sampler</li> <li>– a drift bottle to determine direction of ocean current</li> <li>– a plankton net or a surface plankton pump.</li> </ul> </li> <li>• locate thermoclines in a body of water</li> <li>• construct or observe a drogue used to measure subsurface current</li> <li>• construct a bottom profile from river or bay soundings</li> <li>• examine sludge taken from river or ocean floor and identify components</li> <li>• recall the structure of the ocean including the ocean floor</li> <li>• compare and contrast ocean floor and</li> </ul>

<ul style="list-style-type: none"><li>• shapes of the ocean basins</li><li>• forces that cause ocean water to move</li><li>• qualifications needed to become an oceanographer and career opportunities in this area</li></ul>	<p>terrestrial topography</p> <ul style="list-style-type: none"><li>• list the forces that cause ocean water to move</li><li>• describe in local environments how winds, tides, and ocean currents are formed</li><li>• recognise the career opportunities for oceanographers</li></ul>
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## Optional Module 8: Local Area Study

**Indicative Hours: 15**

### **Description**

This module has been designed to allow a detailed study of the student's local area, highlighting the marine and aquatic ecosystems present and relating the effects of the land, its use and human population in these systems. It provides an ideal opportunity to put previously acquired investigative skills into practice.

Students investigate the following questions:

- What are the features of my local area?
- What marine and aquatic ecosystems are present?
- What is the content of the closed river system and coastal zone?
- How has the past history of the area affected marine and aquatic systems in the area?
- What techniques can be used to measure features of the area's ecosystems, physical and chemical?

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 2.1 appreciates the importance of effective management practice
- 2.2 works effectively within a group
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.2 collects and organises data by accurately reading instruments, signals and charts, and systematically recording, summarising, tabulating and graphing
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### **Notes to teachers**

- The Department of Land and Water Conservation has good resources on all areas of NSW.
- Local councils commonly have environmental planning maps.
- Historical sites and records in most towns are an excellent source of material.

## Optional Module 8: Local Area Study

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• the extent of a river catchment and coastal zone</li>   <li>• the nature of their local area, past and present, including the ecosystems present</li>   <li>• the measurement of water quality                             <ul style="list-style-type: none"> <li>– the nine common tests used to monitor water quality</li> </ul> </li>   <li>• appropriate methods used to research and report information concerning their local area                             <ul style="list-style-type: none"> <li>– factors used to identify their local area</li> <li>– the main physical and cultural features of the local area</li> <li>– the main biological features of the local area</li> </ul> </li>   <li>• the use of laboratory apparatus for observations, measurement, recording and analysis of data, and experimentation</li> </ul>	<ul style="list-style-type: none"> <li>• locate an appropriate river catchment</li> <li>• investigate if this river system is part of another larger system</li> <li>• state where this system enters into the sea</li>   <li>• classify the main types of aquatic ecosystems found in their local information area</li> <li>• identify the impact of past human land use on present ecosystems</li>   <li>• critically examine the physical features of the test site                             <ul style="list-style-type: none"> <li>– human disturbances</li> <li>– shade</li> <li>– sediment characteristics</li> <li>– visible pollution source</li> <li>– predominant vegetation</li> <li>– land use of area</li> <li>– depth</li> <li>– flow</li> </ul> </li>   <li>• locate their local area on a map</li> <li>• map and label the physical and cultural features of the local area</li> <li>• map the major marine and terrestrial ecosystems in their area</li>   <li>• assemble, manipulate and correctly use laboratory apparatus</li> <li>• choose the appropriate apparatus for specific tasks</li> <li>• demonstrate awareness of the limitations of scientific apparatus, including accuracy</li> <li>• design, plan and perform experiments involving observations, measurement, recording and analysis of data, and the formulation of conclusions</li> <li>• follow instructions, consider the need</li> </ul>



<ul style="list-style-type: none"><li>• interpreting information</li></ul>	<p>for safety in the use of equipment and chemicals, and observe safety practices during laboratory work</p> <ul style="list-style-type: none"><li>• use experimental results to formulate further questions, and make and test predictions</li></ul>
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## Optional Module 9: Sea Birds of Our Coast

**Indicative Hours: 15**

### Description

This module introduces students to the sedentary and migratory sea birds found along our coast. The module has been designed to give students an introductory study of sea birds in general with a more detailed study of those species found in a student's local area (species with which students are more familiar). The unit is based around observing and recording local marine bird life.

Students investigate the following questions:

- What is the basic physiology of birds that allows them to fly?
- What additional adaptations do sea birds have that allow them to live successfully around water?
- How can these features be observed?
- What methods can be used to record student observations of seabirds along our coastline?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 2.1 appreciates the importance of effective management practice
- 2.3 works effectively within a group
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.2 collects and organises data by accurately reading instruments, signals and charts and systematically recording, summarising, tabulating and graphing
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 3.4 carries out planned research activities using appropriate measurement observation, classification and recording skills
- 4.1 identifies marine vocations and a range of leisure pursuits.
- 4.2 appreciates marine environments as sources of employment and leisure
- 5.1 values the rules and operating principles of marine equipment and applies them
- 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of marine environment
- 5.3 interprets and follows instructions with accuracy
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### Notes to Teachers

- Students should keep a sighting log book.
- Ornithologists, National Parks and Wildlife Services Rangers, bird caring organisations and bird watching clubs may be keen to assist teachers.

## Optional Module 9: Sea Birds of Our Coast

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• basic physiology of birds                             <ul style="list-style-type: none"> <li>– bone structure in birds related to flight</li> <li>– the differences between bird and human lungs</li> </ul> </li> <li>• adaptations which allow birds to live successfully in and around water                             <ul style="list-style-type: none"> <li>– flight</li> <li>– prolonged flight</li> <li>– wading on soft mud</li> <li>– swimming</li> <li>– camouflage</li> <li>– catching food</li> </ul> </li> <li>• observing and accurately recording these observations</li> </ul>	<ul style="list-style-type: none"> <li>• list the adaptations possessed by birds</li> <li>• use equipment appropriate for viewing sea birds at a distance</li> <li>• identify birds that commonly seek food in                             <ul style="list-style-type: none"> <li>– mud flats</li> <li>– river</li> <li>– sea shores</li> <li>– oceans</li> </ul> </li> <li>• construct a sighting log book listing                             <ul style="list-style-type: none"> <li>– date and time</li> <li>– location</li> <li>– name of bird</li> <li>– approximate numbers</li> <li>– main food</li> <li>– residency (permanent or migratory)</li> </ul> </li> </ul>

## Optional Module 10: Commercial and Recreational Fishing

**Indicative Hours: 30**

### Description

This module will allow students to develop their knowledge of all aspects of commercial and recreational fishing. It introduces students to the theoretical and practical aspects of catching fish.

Students investigate the following questions:

- What is the current state of our wild fish stocks?
- What regulations govern the taking of fish?
- What techniques are used by commercial and recreational fishers?
- How did indigenous people catch fish?
- How can humans fish safely?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 2.1 appreciates the importance of effective management practice
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.3 collects and organises data by reading instruments, signals and charts and systematically recording, summarising, tabulating and graphing
- 3.4 carries out planned research activities using appropriate measurement, observation, classification and recording skills
- 4.2 appreciates marine environments as sources of employment and leisure
- 5.1 values the rules and operating principles of marine equipment and applies them
- 5.3 interprets and follows instructions with accuracy

### Notes to Teachers

- NSW State Fisheries Regulations must be observed when undertaking practical activities.
- Refer to an appropriate education systems handbook, eg DET *Guidelines for the Safe Conduct of Sport and Physical Activity in Schools* (1999).
- This is an ideal opportunity to develop a sound environmental attitude as advocated by many amateur fishing groups – ‘take only what you need’, observe size and bag limits, etc.
- This module may be enhanced by accessing the resources available through NSW Fisheries officers.

## Optional Module 10: Commercial and Recreational Fishing

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• fish habitats and current state of Australian fish stocks</li> <li>• effects of fishing on stocks</li> <li>• regulations covering both amateur and professional fishing                             <ul style="list-style-type: none"> <li>– rules/regulations regarding species, size and bag limits that apply to amateur fishermen</li> <li>– the legal restrictions on professional fishing</li> </ul> </li> <li>• techniques used by amateur and professional fishermen                             <ul style="list-style-type: none"> <li>– catching bait suitable for at least two species of fish</li> <li>– selecting tackle suitable for river and beach fishing</li> <li>– rigging lines to catch at least two species of fish</li> <li>– scaling, gutting and filleting a fish</li> <li>– fishing safety</li> <li>– crab or fish trapping</li> </ul> </li> <li>• safety procedures for fishing from boats, rocks and beaches</li> <li>• fishing methods of indigenous people</li> <li>• different professional fishing techniques</li> <li>• the value of professional fishing to the Australian economy</li> <li>• the effects of commercial and recreational fishing on national and global fish stock of selected species</li> <li>• major commercial fisheries of Australia</li> <li>• the technology used by professional fishermen</li> </ul>	<ul style="list-style-type: none"> <li>• locate fish habitats in one coastal or local area</li> <li>• identify and discuss the status of stocks of major commercial fish species</li> <li>• demonstrate the legal requirements that must be met before a professional licence is granted</li> <li>• demonstrate appropriate fishing techniques</li> <li>• make some item of tackle, eg spinners, sinkers, feathers, etc</li> <li>• make a legal crab or fish trap</li> <li>• undertake a practical investigation of the advantages/disadvantages of professional fishing techniques</li> </ul>

	<ul style="list-style-type: none"><li>• identify the parts of trawl gear and explain their functions</li><li>• interpret a sonar chart</li><li>• locate fishing areas using GPS</li><li>• identify those changes to equipment that have been made to prevent damage to the marine environment or species, eg turtle excluders</li></ul>
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## Optional Module 11: Aquaculture

**Indicative Hours: 15/30**

### Description

This module introduces students to the fastest growing primary industry in the nation. Students should understand that present levels of wild capture cannot be maintained, that habitat degradation in nursery areas is limiting wildstock replacement rates, and increasing demand for seafood makes aquaculture a viable alternative source.

Students investigate the following questions:

- What is aquaculture?
- How does aquaculture differ from agriculture?
- What are the basic principles that apply to all forms of aquaculture?
- What sites are suitable for aquaculture?
- Why is aquaculture important?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 1.5 demonstrates an awareness of the value of the ocean as a source of historical information
- 2.1 appreciates the importance of effective management practice
- 2.2 works effectively within a group
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.3 generates information from data by calculating, inferring, interpreting and generalising

### Notes to teachers:

- NSW Fisheries permits are required to take and house undersize species. They are readily obtainable for educational institutions.
- NSW Fisheries permits are required to keep endangered species.
- NSW Fisheries permits are required to grow red claw.
- Environmental Protection Authority and local government rules and regulations for the discharge of water from aquaculture units must be adhered to.
- This module may be enhanced by accessing resources available through NSW Fisheries and Queensland Department of Primary Industries.
- Practical assessment projects could include setting up a brine shrimp hatchery, or growing blue claw, red claw or other species, or a species dissection report.

## Optional Module 11: Aquaculture

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• the nature and scope of aquaculture                             <ul style="list-style-type: none"> <li>– intensive aquaculture</li> <li>– extensive aquaculture</li> <li>– species of marine organisms suitable for aquaculture</li> </ul> </li>   <li>• the importance and potential of aquaculture to                             <ul style="list-style-type: none"> <li>– provide sea food sustainably</li> <li>– protect wild fish stock</li> <li>– relieve pressure on endangered species</li> <li>– create employment</li> <li>– produce species of size for consumption that would be illegal if taken in the wild.</li> </ul> </li>   <li>• the sites of aquaculture                             <ul style="list-style-type: none"> <li>– open water</li> <li>– enclosed water</li> <li>– ponds</li> <li>– tanks</li> </ul> </li>   <li>• the problems associated with aquaculture                             <ul style="list-style-type: none"> <li>– climate/environmental conditions</li> <li>– nutrition</li> <li>– genetics</li> <li>– diseases and pests</li> <li>– management</li> </ul> </li>   <li>• the general requirements of organisms to be farmed</li>   <li>• the problems associated with aquaculture including                             <ul style="list-style-type: none"> <li>– difficulties involved in obtaining eggs and sperm</li> <li>– high capital costs involved in many types of aquaculture</li> <li>– pests and diseases</li> <li>– difficulties in obtaining suitable sites and subsequent climatic modifications required</li> <li>– waste production and removal</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• compare and contrast agriculture with aquaculture</li> <li>• assess the current procedures for checking fish and crustacean stocks, threatened species and habitat destruction and discuss the need for aquaculture</li>   <li>• identify sites that would favour aquaculture</li>   <li>• propose ways of managing problems associated with aquaculture</li>   <li>• select and grow at least one commercial aquaculture species</li> </ul>



<ul style="list-style-type: none"><li>• the animal groups most suited to aquaculture<ul style="list-style-type: none"><li>– large algae</li><li>– bony fish</li><li>– crustaceans</li><li>– molluscs</li></ul></li><li>• The equipment used in aquaculture and its operation including pumps, filters, oxygenators, sterilisers and protein skimmers</li><li>• the potential of aquaculture to provide sea food sustainably and<ul style="list-style-type: none"><li>– protect wild fish stocks</li><li>– relieve pressure on endangered species</li><li>– create employment</li><li>– produce species of a size for consumption that would be illegal if taken in the wild</li></ul></li></ul>	<ul style="list-style-type: none"><li>• describe specific aquaculture techniques appropriate to various forms of marine life</li><li>• design and make a simple bio-filter or sediment filter</li><li>• select and use appropriate equipment such as pumps, filters, oxygenators, sterilisers and protein skimmers to ensure a healthy aquaculture environment</li></ul>
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## **Optional Module 12: Marine Resource Management**

**Indicative Hours: 15**

### **Description**

This optional module provides students with the opportunity to gain an appreciation of the scope and value of resources found in the oceans and used by humans. The module also addresses regulatory practices which allow sustained use of these resources.

Students investigate the following questions:

- What resources are found in the marine environment?
- How are these resources extracted and used by man?
- How can these resources be managed?

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms.
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 4.2 appreciates marine environments as sources of employment and leisure.
- 5.1 values the rules and operating principles of marine equipment and applies them
- 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of marine environment
- 5.3 interprets and follows instructions, with accuracy

### **Notes to Teachers**

A range of sites which are related to this module are available on the internet.

## Optional Module 12: Marine Resource Management

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• the types of marine resources</li>   <li>• our needs and uses of the sea as a source of               <ul style="list-style-type: none"> <li>– food</li> <li>– minerals and rare metals</li> <li>– oil and gas</li> <li>– chemicals</li> <li>– exotic products</li> <li>– natural wilderness</li> </ul> </li>   <li>• the uniqueness of the marine environment               <ul style="list-style-type: none"> <li>– the relationship between Aboriginal peoples and the sea</li> </ul> </li>   <li>• major management and regulatory agencies               <ul style="list-style-type: none"> <li>– the role of the government in maintaining marine resources</li> <li>– Australian marine parks and reserves</li> <li>– marine reserves of international importance</li> <li>– major and international treaties and regulations dealing with marine pollution</li> <li>– the history of global marine resource management during the twentieth century</li> </ul> </li>   <li>• effective and/or ineffective management practices in               <ul style="list-style-type: none"> <li>– turtle populations</li> <li>– the tuna industry</li> <li>– the prawning industry</li> <li>– the fishing industry</li> <li>– coral reefs, eg the Great Barrier Reef</li> <li>– the whaling industry</li> <li>– coastal, estuarine and wetland development</li> </ul> </li>   <li>• sustainable development</li> </ul>	<ul style="list-style-type: none"> <li>• research and report on local uses of marine resources and local community needs which place pressure on marine resources</li>         <li>• compare and contrast the historical and contemporary management practices of Aboriginal people</li>   <li>• evaluate major local or global management plans undertaken by relevant agencies</li>         <li>• recognise and discuss the need for species diversification and ecological balance</li> </ul>

<ul style="list-style-type: none"><li>• consequences of resource over-exploitation</li><li>• renewable and non renewable resources in terms of immediate and future requirements</li><li>• sources of marine pollution including<ul style="list-style-type: none"><li>– natural</li><li>– industrial (including petroleum, marine litter, synthetic or organic compounds, pesticides, mining refuse)</li><li>– agricultural (including topsoils, pesticides, fertilisers)</li><li>– radioactive substances</li><li>– conflict</li><li>– community development (eg run off, etc)</li><li>– ballast water</li></ul></li><li>• major disputes over the use of a particular resource</li></ul>	<ul style="list-style-type: none"><li>• research, propose and participate in methods for solving local pollution problems including:<ul style="list-style-type: none"><li>– clean up</li><li>– prevention</li><li>– regulation</li><li>– research</li></ul></li><li>• debate the conflict between community needs and preservation of the marine environment</li></ul>
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## **Optional Module 13: The Marine Aquarium**

**Indicative Hours: 15/30**

### **Description**

This module allows students the opportunity to develop an aquarium environment based on current and emerging technologies. Emphasis on practical skills and working with aquariums is strongly encouraged in the module.

Students investigate the following questions:

- What is an aquarium?
- Why do people have aquariums?
- How can an aquarium be made?
- How do you care for aquariums and aquarium species?

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 2.2 works effectively within a group
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 5.1 values the rules and operating principles of marine equipment
- 5.3 interprets and follows instructions with accuracy

### **Notes to Teachers**

- Complicated and expensive equipment is not necessary for the delivery of this module.
- NSW State Fisheries licences are required to display undersize fish.
- Permits to hold endangered species are attainable from NSW Fisheries.
- Animal welfare regulations apply to this module.
- Emphasis should be placed on principles and how they relate to practice. Where possible this should be clearly demonstrated, eg when making a biofilter, food grade plastic (bottle tops, cut up ice cream containers) should be used rather than purchasing expensive 'bio balls'.

## Optional Module 13: The Marine Aquarium

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• the marine ecosystem                             <ul style="list-style-type: none"> <li>– recognise the chemical and physical requirements of marine plants and animals</li> </ul> </li> <li>• ways that the physical and chemical requirements can be satisfied in small and large aquariums</li> <li>• the need for filtration systems in an aquarium</li> <li>• how different types of filters work</li> <li>• food requirements of marine aquarium species</li> <li>• diseases affecting aquarium fish and crustaceans</li> <li>• the removal of nutrients, proteins and sediment</li> <li>• constructing a fish tank</li> <li>• constructing filters</li> <li>• monitoring water quality</li> <li>• how to compensate for changes in:                             <ul style="list-style-type: none"> <li>– temperature</li> <li>– light concentration</li> <li>– pH</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• select and effectively operate appropriate filtration systems on an aquarium</li> <li>• design and use an appropriate feeding plan for aquarium fish</li> <li>• diagnose from books common diseases of marine fish and crustaceans</li> <li>• remove nutrients, protein and sediment using appropriate equipment</li> <li>• construct a glass fish tank from pre-cut sheets</li> <li>• assemble a sand filter, a bio filter or alga scrubber</li> <li>• test water for                             <ul style="list-style-type: none"> <li>– nitrate concentration</li> <li>– phosphate concentration</li> <li>– temperature</li> <li>– pH</li> <li>– nutrients</li> <li>– protein</li> <li>– sediment</li> </ul> </li> <li>• apply appropriate methods to compensate for changes in                             <ul style="list-style-type: none"> <li>– temperature</li> <li>– light concentration</li> <li>– pH</li> </ul> </li> <li>• retrieve sea water for use in an aquarium</li> </ul>

<ul style="list-style-type: none"><li>• handling fish and crustacea</li><li>• feeding fish and crustacea</li></ul>	<ul style="list-style-type: none"><li>• collect, handle and transport fish without causing them trauma</li></ul>
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## **Optional Module 14: Anatomy and Physiology of Marine Organisms**

**Indicative Hours: 15**

### **Description**

This module introduces students to the anatomy and physiology of marine plants and animals. Students have the opportunity to study in depth a marine plant or animal of their choice. The module aims to make students aware of the complexity of marine organisms and their adaptations.

Students investigate the following questions:

- What are the differences between marine and terrestrial plants and animals?
- How is anatomy related to physiology?
- What features of this organism make it well suited to where it lives?

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 2.1 appreciates the importance of effective management practice
- 2.2 works effectively within a group
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 4.2 appreciates marine environments as sources of employment and leisure.
- 5.1 values the rules and operating principles of marine equipment and applies them
- 5.3 interprets and follows instructions with accuracy

### **Notes to teachers**

- Selection of the organism by the student should be made in consultation with the teacher.
- Rare species should be avoided where dissection is involved.
- Regulations derived from the Animal Welfare Act must be adhered to.



## Optional Module 14: Anatomy and Physiology of Marine Organisms

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• anatomy of marine organisms                             <ul style="list-style-type: none"> <li>– anatomical structures</li> <li>– functions of these structures</li> </ul> </li>   <li>• physiology of marine organisms                             <ul style="list-style-type: none"> <li>– energy production</li> <li>– excretion</li> <li>– muscular coordination</li> <li>– respiration</li> </ul> </li>   <li>• the anatomy of one animal from one of the animal groups                             <ul style="list-style-type: none"> <li>– crustaceans</li> <li>– fish (teleosts)</li> <li>– mammals</li> <li>– coral</li> </ul> </li>    <p>OR</p> <li>• the anatomy of one marine plant, including the structure of that organism's                             <ul style="list-style-type: none"> <li>– body covering</li> <li>– feeding system</li> <li>– digestive system</li> <li>– respiratory system</li> <li>– circulatory and transport system</li> <li>– excretory system</li> <li>– locomotor system</li> <li>– coordination system including senses</li> <li>– reproductive system</li> </ul> </li>    <li>• the chosen organism's physiology (or how these systems operate within the chosen organism)</li>   <li>• relating the features of an organism to its successful operation and survival in its environment</li> </ul>	<ul style="list-style-type: none"> <li>• select an animal and                             <ul style="list-style-type: none"> <li>– explain the major systems present</li> <li>– sketch the parts of the ingestive, digestive, respiratory, circulatory, excretory, skeletal, muscular co-ordination and reproductive systems</li> <li>– describe how these systems operate and are coordinated to keep the animal alive</li> <li>– describe the features of this organism that make it suited to where it lives</li> </ul> </li>    <p>OR</p> <li>• select a plant and:</li> <li>• list the major systems present in a marine plant</li> <li>• describe how the plant takes in minerals, produces organic compounds, removes waste, responds to stimuli</li> <li>• recognise the importance of photosynthesis to marine plants</li> <li>• connect the selective filtration of light by water with the depth where most marine plants live</li> </ul>

## **Optional Module 15: Seafood Handling and Processing**

**Indicative Hours: 30**

### **Description**

This module provides students with the opportunity to prepare seafood for eating. The module is designed to make students aware of the fragile nature of marine organisms and their rapid spoilage after capture.

Students investigate the following questions:

- What seafoods are consumed in Australia?
- Why does seafood spoil so rapidly?
- What handling procedures are required for seafood?
- How can seafood be prepared?

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 1.5 demonstrates an awareness of the value of the ocean as a source of historical information
- 2.1 appreciates the importance of effective management practice
- 2.2 works effectively within a group
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 3.4 carries out planned research activities using appropriate measurement observation, classification and recording skills
- 4.2 appreciates marine environments as sources of employment and leisure
- 5.1 values the rules and operating principles of marine equipment
- 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of marine environment
- 5.3 interprets and follows instructions with accuracy

### **Notes to teachers**

- Useful resources on seafood handling may be available from TAFE and from the Department of Primary Industries.
- Posters and teaching resources can also be sourced through NSW Fisheries and district fishing cooperatives.

## Optional Module 15: Seafood Handling and Processing

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• the history of seafood in the Australian diet</li>   <li>• the development of seafood in the diets of Australians of                             <ul style="list-style-type: none"> <li>– Aboriginal origin</li> <li>– European origin</li> <li>– Asian origin</li> <li>– Mediterranean origin</li> <li>– other groups</li> </ul> </li>   <li>• types of seafood available in Australia</li>   <li>• the basic nutritional components of seafood</li> <li>• the major criteria for selection of fresh seafood</li>   <li>• correct storage procedures                             <ul style="list-style-type: none"> <li>– commercial</li> <li>– domestic</li> </ul> </li>   <li>• structure of fish related to cooking                             <ul style="list-style-type: none"> <li>– the gross and fine structural features of fish</li> <li>– basic methods of seafood preparation</li> <li>– the major procedures involved in processing seafood</li> <li>– the important features of seafood in the catering industry in the national and international areas</li> </ul> </li>   <li>• communicating ideas and the appropriate terminology associated with cooking seafood</li>   <li>• selecting seafood</li>   <li>• preparing seafood prior to cooking</li> </ul>	<ul style="list-style-type: none"> <li>• research and analyse the trends in seafood consumption in the local community over the past 40 years</li>         <li>• analyse the nutritional value of a range of seafoods</li>         <li>• observe the changes to structure, texture and nutritional value of food caused by cooking</li> <li>• catalogue recipes suitable for different courses and styles of presentation</li>     <li>• use correctly the language associated with cooking seafood</li>     <li>• choose appropriate types of seafood based on recipe, price, and freshness</li>   <li>• demonstrate an ability to prepare seafood prior to cooking or eating by:                             <ul style="list-style-type: none"> <li>– washing</li> </ul> </li> </ul>

<ul style="list-style-type: none"><li>• cooking seafood</li> <li>• presenting seafood meals<ul style="list-style-type: none"><li>– how presentation methods depend on culture</li></ul></li> <li>• storing seafood</li></ul>	<ul style="list-style-type: none"><li>– cleaning (gutting and scaling)</li><li>– removing external shell</li><li>– filleting</li> <li>• select an appropriate recipe depending on:<ul style="list-style-type: none"><li>– availability</li><li>– price</li><li>– suitability to taste or culture</li></ul></li> <li>• follow instructions to cook or prepare seafood for eating</li> <li>• relate the different modes of presentation for eating</li><li>• select suitable accompaniments for a seafood meal</li> <li>• prepare a variety of seafood for storage</li></ul>
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## Optional Module 16: Skin Diving and Diving Science

**Indicative Hours: 30**

### Description

This module intends to examine many of the areas of knowledge and skills appropriate to the use of diving equipment. In this module students are taught the fundamentals of skin diving and should become proficient in the practices that will ensure their safety. Students should also be given the opportunity to obtain internationally recognised diving credentials while completing this unit. The emphasis lies in the development of skills related to water safety.

Students investigate the following questions:

- What equipment is needed for diving?
- How is this equipment cared for?
- What are the effects of skin diving on the human body?
- How can skin diving avoid accidents?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 2.1 appreciates the importance of effective management practice
- 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of the marine environment

### Notes to Teachers

- DET guidelines set out in handbook *Guidelines for the Safe Conduct of Sport and Physical Activities in Schools* for skin diving, scuba diving and snorkelling must be adhered to.
- The students should be given the opportunity to gain Open water SCUBA qualifications.
- It is recognised that some students may wish to progress further; advanced diver and rescue diver units offered by private providers can be used as additional modules but must not exceed 60 hours of diving-based modules.
- Satisfactory completion of and subsequent certification in any nationally recognised scuba or skin diving course satisfies the outcomes of this unit.

Examples of such courses include:

- NAUI – Skindiver course
- AUF – School Snorkelling Program
- NAUI – Open water Diver
- PADI – Advanced Open water Diver
- NAUI – Open water II Diver
- Any specialist diver courses

## Optional Module 16: Skin Diving and Diving Science

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• equipment                             <ul style="list-style-type: none"> <li>– mask</li> <li>– wetsuit</li> <li>– snorkel</li> <li>– weight belt</li> </ul> </li> <li>• the care and maintenance of diving equipment                             <ul style="list-style-type: none"> <li>– washing</li> <li>– storing correctly</li> <li>– performing safety checks</li> </ul> </li> <li>• hand signals and safety rules for diving</li> <li>• the international diver’s flag and its associated safety zone</li> <li>• the effects of pressure on the body</li> <li>• gas laws affecting the body                             <ul style="list-style-type: none"> <li>– Boyle’s law</li> <li>– Charles’ law</li> <li>– Dalton’s law</li> <li>– Henry’s law</li> </ul> </li> <li>• the composition of air</li> <li>• body physiology</li> <li>• the role of the circulatory and respiratory systems in the diving environment</li> </ul>	<ul style="list-style-type: none"> <li>• successfully select, adjust and don equipment</li> <li>• care for and maintain diving equipment</li> <li>• demonstrate the basic hand signals</li> <li>• recall the correct safety zone and use appropriate precautions when diving from examples of                             <ul style="list-style-type: none"> <li>– jetty</li> <li>– beach</li> <li>– boat</li> <li>– rocky foreshore</li> </ul> </li> <li>• demonstrate an understanding of the composition and effect on the body of                             <ul style="list-style-type: none"> <li>– oxygen</li> <li>– nitrogen</li> <li>– carbon dioxide</li> <li>– carbon monoxide</li> </ul> </li> </ul>

<ul style="list-style-type: none"> <li>• recognise the advantages of good health and fitness</li> <li>• recall the different types of aquatic life, including             <ul style="list-style-type: none"> <li>– plants</li> <li>– vertebrates</li> <li>– invertebrates</li> </ul> </li> <li>• recall the regulations governing the conservation of aquatic life</li> <li>• causes, avoidance and treatment of diving accidents</li> <li>• the factors affecting diving conditions</li> <li>• swimming and snorkelling skills in a pool or confined water area             <ul style="list-style-type: none"> <li>– with no equipment</li> <li>– with a mask and snorkel</li> </ul> </li> <li>• diving in open water conditions</li> </ul>	<ul style="list-style-type: none"> <li>• demonstrate the correct procedure to avoid diving accidents</li> <li>• apply basic resuscitation and first aid as applied to the diving situation</li> <li>• plan a successful and safe diving trip</li> <li>• critically examine and be able to choose the correct dive site when presented with different diving conditions</li> <li>• competently demonstrate, with no equipment, how to             <ul style="list-style-type: none"> <li>– swim underwater for 10 metres, without push off or dive</li> <li>– swim underwater for 20 metres, taking three breaths during swim</li> </ul> </li> <li>• competently demonstrate with masks, fins and snorkel, how to             <ul style="list-style-type: none"> <li>– snorkel 400 metres on the surface non-stop</li> <li>– demonstrate the correct technique for clearing off the mask and snorkel whilst underwater</li> </ul> </li> <li>• in open water             <ul style="list-style-type: none"> <li>– survival swim for 5 minutes, removing and replacing and adjusting each piece of dive equipment in turn</li> <li>– correctly establish neutral buoyancy</li> <li>– demonstrate correct water entry and exit procedures from jetty, boats, beaches and rocky foreshore</li> <li>– snorkel 400 metres non-stop without using hands</li> <li>– demonstrate the correct procedures</li> </ul> </li> </ul>
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	<p>for clearing ears during a dive</p> <ul style="list-style-type: none"><li>– recover an object of about 5 kg mass from about 4 metres depth</li><li>– demonstrate correct underwater rescue procedures</li><li>– demonstrate correct diver-assisted tows</li></ul>
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## Optional Module 17: Marine Engineering

**Indicative Hours: 15 or 30**

### Description

This module investigates structures and practices that humans have used to modify the marine environment to suit their needs. This module seeks to make students aware of the power of the sea and its 'unforgiving nature' on humans who do not respect it. The module provides a good opportunity for students to investigate the successful and not so successful structures man has built.

Students investigate the following questions:

- Why has man needed to modify the marine environment?
- What structures and practices do humans use to modify the effects of currents, waves, sand migration, erosion, deposition, floods and mixing of salt and fresh water?
- What are the effects of these structures on the ecosystems in which they are located?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 2.1 appreciates the importance of effective management practice
- 2.2 works effectively within a group
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 3.4 carries out planned research activities using appropriate measurement observation, classification and recording skills
- 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of the marine environment

### Possible Assessment Strategies

- Construct a range of model barriers and test in stream tray.
- Excursion report on visits to harbour hydrology laboratories or estuaries that display engineering structures.
- Workbooks on visits to an engineered structure.
- Individual or group report on effects of a local marine structure and the marine environment.

### Notes to teachers

Local flood mitigation authorities and Department of Land and Water Conservation have a range of suitable resources relevant to this module.

## Optional Module 17: Marine Engineering

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• the effect of the marine environment on human activity                             <ul style="list-style-type: none"> <li>– structures used to overcome limitations on human activity</li> <li>– machines invented to overcome limitations</li> </ul> </li>   <li>• the effects of sea action on the terrestrial landscape</li>   <li>• the impact of solid barriers and artificial reefs as protection against wear</li>   <li>• the common methods of foreshore protection, eg                             <ul style="list-style-type: none"> <li>– riparian revegetation</li> <li>– sand dune stabilisation</li> <li>– rockwall construction and protection</li> </ul> </li>   <li>• the effectiveness of dykes in containing sea level changes</li>   <li>• dredging, sand pumps and training walls and their effectiveness in minimising the effects of deposition</li>   <li>• the effect of flood gates/weirs/fabriclams and levels as methods of flood mitigation</li> </ul>	<ul style="list-style-type: none"> <li>• select and use appropriate categories to identify structures in a particular coastal region that aid human activity on water                             <ul style="list-style-type: none"> <li>– bridges, tunnels, ramps, wharves, piers, harbours and docks</li> <li>– underwater observatories, underwater inspection and monitoring structures</li> </ul> </li>   <li>• select and use appropriate categories for machines used by humans to enable activities on the water surface</li>   <li>• categorise effects of sea action such as                             <ul style="list-style-type: none"> <li>– currents</li> <li>– waves</li> <li>– erosion/deposition</li> <li>– sand migration</li> </ul> </li>   <li>• illustrate how retaining walls change direction and rate of flow of water</li>   <li>• observe methods of foreshore protection and propose methods for foreshore protection in identified situations</li>   <li>• research and observe previous levels of flooding in a local area before and after the introduction of a specific flood mitigation method</li> </ul>

## Optional Module 18: Marine Archaeology

**Indicative Hours: 30**

### Description

This module introduces students to the history of shipwrecks and to underwater and shore-based archaeological sites of indigenous and migrant peoples. It investigates site preservation considerations and management strategies.

Students investigate the following questions:

- What is archaeology?
- How is marine archaeology different to terrestrial archaeology?
- What methods are used by marine archeologists?
- How are sites preserved?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the role of individuals or groups involved in maritime activities
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 2.1 appreciates the importance of effective management practice
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 3.4 carries out planned research activities using appropriate measurement observation, classification and recording skills
- 4.2 appreciates marine environments as sources of employment and leisure
- 5.1 values the rules and operating principles of marine equipment and applies them
- 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of the marine environment

### Notes to teachers

- The NSW Heritage Office at sites [www.nsw.gov.au](http://www.nsw.gov.au) and [www.heritage.nsw.gov.au](http://www.heritage.nsw.gov.au) has a valuable folder of resource material for this unit.

## Optional Module 18: Marine Archaeology

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• the science and methods of archaeology</li> <li>• the role of the archaeologist</li> <li>• the conditions that describe a site</li> <li>• the criterion used to determine ‘the nature of significance’</li> <li>• underwater skills needed to record information about wrecks</li> <li>• the chemistry of metal and timber preservation</li> <li>• how ships are raised and conserved</li> <li>• the laws that protect marine historical areas</li> <li>• how areas of cultural significance are protected</li> <li>• the equipment used to unearth scattered wreckage</li> <li>• craft types used by Aboriginal and Torres Strait Islander people</li> <li>• the extent of Aboriginal and Torres Strait Islander history</li> <li>• the role of the coastal shipping trade from which the wrecks resulted</li> <li>• types of cargo carried by coastal shipping</li> <li>• why shipwrecks occurred so frequently</li> <li>• the technical, social and scientific</li> </ul>	<ul style="list-style-type: none"> <li>• describe and explain why some wrecks are more important than others</li> <li>• demonstrate underwater skills commonly used in recording information about wrecks</li> <li>• preserve ferrous metals using anodic and cathodic protection</li> <li>• conserve timber by replacing dissolved salts with preservative solution</li> <li>• apply relevant legislation to artefacts and newly discovered wreck sites</li> <li>• investigate the role of the heritage office, the community centre and developers</li> <li>• classify equipment according to               <ul style="list-style-type: none"> <li>– locational ability</li> <li>– unearthing ability</li> </ul> </li> <li>• construct replica craft which demonstrate correct historical construction processes</li> <li>• locate local shipping hazards</li> <li>• identify design flaws of ships</li> </ul>

contexts of archaeology	
• career areas within archaeology	

## **Optional Module 19: Boating and Seamanship**

**Indicative Hours: 30**

### **Description**

This optional module acknowledges the high level of boat ownership in Australia and the economic importance of small boat operation. Students are given the opportunity to learn the basics of small boat operation and handling.

Students investigate the following questions:

- What equipment is needed by small boat owners?
- How are small boats and their equipment maintained?
- What rules and procedures are there for operating small boats safely?
- Who has responsibility for the proper and safe operation of small boats?

### **Outcomes**

A student:

- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 2.2 works effectively within a group
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.2 collects and organises data by accurately reading instruments, signals and charts; by systematic recording, summarising, tabulating and graphing
- 5.1 values the rules and operating principles of marine equipment
- 5.3 interprets and follows instructions with accuracy
- 5.4 selects, organises, assembles, dismantles, cleans and returns equipment

### **Notes to teachers**

- Students should be encouraged to obtain their NSW Waterways Boat Drivers Licence during this module.
- Waterways NSW Safe Boating Handbooks are available from Waterways Offices.
- Waterways Officers are often available to instruct students in schools.

## Optional Module 19: Boating and Seamanship

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• emergency and safety procedures                             <ul style="list-style-type: none"> <li>– standard safety and distress signals</li> <li>– basic rescue and first-aid procedures applicable to boating</li> <li>– important rescue agencies</li> </ul> </li> <li>• the equipment required by law when boating in enclosed and open water in NSW</li> <li>• seamanship</li> <li>• methods used to solve boating related problems                             <ul style="list-style-type: none"> <li>– towing a trailer</li> <li>– basic maintenance procedures for a trailer</li> <li>– regulations governing safe passage of small craft on water</li> <li>– cardinal and lateral system of buoyage</li> <li>– regulations governing salvage</li> <li>– the use of basic knots and splices at sea</li> <li>– standard launching and landing procedure from a ramp or slipway</li> <li>– loading and trimming a vessel</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• enact emergency and safety procedures for operating small boats                             <ul style="list-style-type: none"> <li>– man overboard</li> <li>– fire at sea</li> <li>– disabled craft running aground</li> <li>– being towed</li> <li>– travelling at night by boat</li> </ul> </li> <li>• respond safely and responsibly to situations which could result in a variety of outcomes</li> <li>• plan a safe boating trip</li> <li>• determine the latitude and longitude of a position on a chart</li> <li>• explain how to locate one’s position using a transit bearing or a cross bearing fix</li> <li>• determine the variation and deviation of a compass for a particular location and ship’s heading</li> <li>• row a small boat</li> <li>• fit an outboard motor to a small boat</li> <li>• anchor and secure a small boat</li> <li>• come alongside another vessel safely</li> <li>• handle a small boat in windy conditions and with current and tidal flow</li> <li>• use a compass in a boat</li> <li>• demonstrate basic maintenance procedures for a trailer</li> <li>• demonstrate the use of basic knots and splices</li> <li>• participate in standard launching and landing procedure from a ramp or slipway</li> <li>• prepare a boat for operation prior to launching</li> <li>• load and trim a vessel correctly</li> </ul>

<ul style="list-style-type: none"><li>correctly<ul style="list-style-type: none"><li>– determining the sea-worthiness of a vessel</li></ul></li><li>• the care and maintenance of boats and engines</li> <li>• the identification of areas of responsibility<ul style="list-style-type: none"><li>– responsibilities of small boat ownership</li><li>– responsibilities of the driver or captain</li></ul></li></ul>	<ul style="list-style-type: none"><li>• maintain equipment used on a boat</li><li>• care for and maintain an outboard motor</li><li>• clean a boat and its equipment after use prior to storage</li><li>• back a trailer correctly</li><li>• launch and recover a boat from a ramp, slipway beach or jetty</li> <li>• obtain information related to the purchase of insurance</li></ul>
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## **Optional Module 20: Marine Craft Construction and Repair**

**Indicative Hours: 30**

### **Description**

This module provides students with the opportunity to design and construct models or actual marine craft and to maintain and repair them. This highly practical module encourages students to investigate the materials used for marine construction and to relate the choice of material to the harsh forces found in marine systems.

Students are actively encouraged to bring damaged personal marine equipment for repair during this unit. It is anticipated that this module will form the basis for major projects in many schools.

Students investigate the following questions:

- What are the destructive forces found in the marine environment?
- What natural materials can withstand these forces?
- What synthetic materials have been made to lengthen the life of marine craft?
- What principles apply to the repair and maintenance of marine craft?

### **Outcomes**

A student:

- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 3.4 carries out planned research activities using appropriate measurements, observations, classification and recording skills
- 5.1 values the rules and operating principles of marine equipment and applies them
- 5.2 applies information including weather, regulations, procedures and skills to ensure safe use of the marine environment
- 5.3 interprets and follows instructions with accuracy

### **Notes to teachers**

- This module provides sufficient scope to allow students to make and repair a wide range of marine equipment.
- The practical work can include constructing and repairing surfboards, sails, boats, trailers, fishing rods, safety equipment, etc, as well as models. Students could design a boat.
- The outcomes for this module can be satisfied/achieved by group work on a large project, eg assembling and finishing a commercial Kit Boat.

## Optional Module 20: Marine Craft Construction and Repair

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• the destructive forces found in the marine environment that cause natural and man-made materials to break down including sunlight, water; salt, oxygen and living organisms</li> <li>• natural materials used historically in the construction of marine craft including wood, animal skin, plant fibres                             <ul style="list-style-type: none"> <li>– the break down of these materials in nature and that they can be food for many organisms</li> <li>– that if these materials are to be used they must be protected from attack by destructive agents</li> </ul> </li> <li>• synthetic materials used to lengthen the life of marine craft                             <ul style="list-style-type: none"> <li>– the properties of the synthetic material compared to the natural material it replaces</li> <li>– the common forms of protection used in marine craft</li> </ul> </li> <li>• principles of repair and maintenance that apply to marine craft                             <ul style="list-style-type: none"> <li>– relate the type of maintenance to the complexity of the craft</li> </ul> </li> <li>• the effects of poor maintenance of marine craft on the marine environment</li> <li>• possible side effects of material protection methods (eg copper and antifouling agents)</li> <li>• methods of marine construction</li> </ul>	<ul style="list-style-type: none"> <li>• classify and use examples of materials used in marine construction and repair such as copper, zinc, iron, and the marine alloys, steel and stainless steel</li> <li>• discuss and plan the repair of a selected craft</li> <li>• appreciate that repair techniques are determined by the material used and are often very specific</li> <li>• identify the effects marine craft have had on the marine environment</li> <li>• carry out simple experiments demonstrating the side effects of material protection</li> <li>• construct models of marine craft</li> </ul>

## Optional Module 21: Pilotage and Navigation

**Indicative Hours: 30**

### **Description:**

This module gives students the basic knowledge enabling them to safely direct a boat at sea. It introduces students to pilotage, and seeks to make them proficient in recognising and realising the significance of buoys, beacons and markers. It also gives them a basic understanding of the methods mariners use to safely direct their vessels inshore and offshore.

Students will investigate the following questions:

- What is navigation?
- How do mariners guide their craft safely from port to port?
- How are ships guided into port?
- What international conventions apply to prevent collisions at sea?

### **Outcomes:**

A student:

- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 2.2 works effectively within a group
- 3.3 generates information from data by calculating, inferring, interpreting and generalising
- 3.4 carries out planned research activities using appropriate measurements, observations, classification and recording skills
- 4.2 appreciates marine environments as sources of employment and leisure.
- 5.1 values the rules and operating principles of marine equipment and applies them
- 5.2 applies information including weather, regulations, procedures, and skills to ensure safe use of the marine environment
- 5.3 interprets and follows instructions with accuracy

### **Notes to teachers**

- This module may be enhanced by accessing resources available through TAFE and other providers delivering navigation courses.
- Where possible it is recommended that models be used for the buoyage section and that the physical movement of a model or the student through the markers be used.

## Optional Module 21: Pilotage and Navigation

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• the difference between piloting and navigation                             <ul style="list-style-type: none"> <li>– pilotage describes how mariners use landmarks, buoys and marks to enter and leave port.</li> <li>– navigation is the art of directing a vessel at sea and encompasses piloting as well as inshore and offshore directing</li> </ul> </li> <li>• navigational light requirements for vessels under way</li> <li>• the lateral and cardinal systems of buoyage</li> <li>• navigation charts and their symbols</li> <li>• basic navigation aids</li> <li>• ocean currents and navigation                             <ul style="list-style-type: none"> <li>– how to locate one's position using a transit bearing or cross bearing fix</li> </ul> </li> <li>• practical navigation                             <ul style="list-style-type: none"> <li>– locating position using a transit bearing, cross bearing fix</li> <li>– the meaning of dead reckoning</li> </ul> </li> <li>• the global current patterns</li> <li>• how ancient mariners used currents to their advantage</li> <li>• how the stars are used to navigate</li> </ul>	<ul style="list-style-type: none"> <li>• identify navigational light requirements for vessels under way</li> <li>• recognise the lateral and cardinal buoyage marks</li> <li>• determine the latitude and longitude of a position on a chart</li> <li>• use or simulate the techniques used in estimating one's position at sea</li> <li>• take compass bearings</li> <li>• adjust calculations to account for compass error</li> <li>• use compass roses, parallel rules and set squares to fix positions on charts</li> <li>• convert bearings from compass to chart and from chart to compass</li> <li>• lay off and plot a course</li> <li>• solve problems involving speed, distance and time</li> <li>• read a depth sounder</li> <li>• use a GPS instrument</li> <li>• observe radar in operation</li> </ul>

<ul style="list-style-type: none"><li>• the modern aids to navigation</li> <li>• international regulations for the prevention of collision at sea</li></ul>	<ul style="list-style-type: none"><li>• determine the bearing followed on a given course.</li> <li>• apply or simulate the international regulations for avoidance of collision at sea.</li></ul>
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## **Optional Module 22: Marine Communication**

**Indicative Hours: 30**

### **Description**

This module gives students the opportunity to operate marine radios following the international conventions for their use. Students completing this unit will possess the knowledge and skills to qualify for the Marine Radio Operations Certificate of Proficiency.

Students investigate the following questions:

- What is marine radio?
- What are the types of marine radio?
- How and why are they used?
- How are they kept in working order?

### **Outcomes**

A student:

- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.1 evaluates information, situations, equipment manuals and written or manual procedures
- 3.2 collects and organises data by accurately reading instruments, signals and charts and systematically recording, summarising, tabulating and graphing
- 5.1 values the rules and operating principles for marine equipment and applies them
- 5.3 interprets and follows instructions with accuracy

### **Notes to teachers**

- School teachers are readily accepted as invigilators able to conduct Marine Radio Examinations.
- Rules and regulations governing the use of Marine Radios must be adhered to.
- For practice, landlines or old CB sets are recommended (Marine Radios cannot be used for practice).
- Successful completion of the Marine Radio Operators Certificate of Proficiency satisfies all the outcomes of this module.
- It is acceptable to use the Radio Operators Certificate of Proficiency theory examination as an assessment task for this module.

## Optional Module 22: Marine Communication

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• using basic signals to transmit and receive visual and verbal messages</li>   <li>• types of radios used at sea</li>   <li>• fault finding on a marine radio</li>   <li>• maintaining a marine radio in operational order</li> </ul>	<ul style="list-style-type: none"> <li>• communicate simple messages using visual or verbal signals including               <ul style="list-style-type: none"> <li>– hand signals</li> <li>– semaphore</li> <li>– verbal commands</li> <li>– whistles</li> </ul> </li>   <li>• distinguish between the various types of marine radios</li> <li>• tune a radio correctly</li> <li>• transmit and receive simple messages using standard radio procedures</li>   <li>• follow the correct format in sending and receiving distress and emergency messages including               <ul style="list-style-type: none"> <li>– pan pan</li> <li>– mayday</li> <li>– securite</li> <li>– mayday relay</li> </ul> </li>   <li>• fill out and interpret a radio operator's log</li> <li>• use the phonetic alphabet for radio operators</li> <li>• locate the nearest local land-based radio transmitter on a chart</li> <li>• plan for a simulated radio contact whilst on a voyage</li> <li>• locate the emergency and working frequency bands on a radio</li> <li>• diagnose simple faults on a marine radio</li> <li>• make simple repairs to faulty radio components, eg fuses, corroded terminals</li> <li>• perform regular maintenance checks to keep a radio in operational order</li> </ul>

## Optional Module 23: Wind Powered Marine Craft

**Indicative Hours: 30**

### Description

This module provides students with the opportunity to learn to sail. It is a highly practical module which encourages students to investigate the history of wind power and wind propulsion systems in a marine context. In this module students are encouraged to experience wind propulsion, either by use of models or preferably using actual craft. Students should be taught the basics of sailing in this module to a level that allows them to become effective crew members on board a sailing boat.

Students investigate the following questions:

- How have mariners harnessed the wind?
- Is there a pattern to the winds on earth?
- What are the forces acting on a sail boat?
- How are these forces used to propel the boat forward?
- What are the rules and regulations governing the use of sail craft?

### Outcomes

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 1.5 demonstrates an awareness of the value of the ocean as a source of historical information
- 2.1 appreciates the importance of effective management practice
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.3 collects and organises data by accurately reading instruments, signals and charts and systematically recording, summarising, tabulating and graphing
- 4.1 identifies marine vocations and a range of leisure pursuits

### Notes to teachers

- This module should include practical sailing activities where possible.
- *Guidelines for the Safe Conduct of Sport and Physical Activity* (1999) must be consulted.



## Optional Module 23: Wind Powered Marine Craft

Students learn about:	Students learn to:
<ul style="list-style-type: none"> <li>• the ways mariners have harnessed the wind</li> <li>• the history of sail</li> <li>• sail design                             <ul style="list-style-type: none"> <li>– developed by different races</li> <li>– different sail shapes and sailing rigs</li> </ul> </li> <li>• patterns of air movement in the atmosphere</li> <li>• the major wind streams on earth</li> <li>• the forces acting on a sail boat</li> <li>• the procedures necessary to rig a boat</li> <li>• the skills needed to sail a boat or board</li> <li>• rules and regulations governing the use of sail craft</li> </ul>	<ul style="list-style-type: none"> <li>• identify different sail shapes and sailing rigs</li> <li>• link the ancient maritime trade routes to these wind streams</li> <li>• observe and describe the forces acting on a boat or board through its sail</li> <li>• diagnose and repair common equipment problems and breakages</li> <li>• tie the following knots – clove, hitch, round turn and two half-hitches, bowline, figure of eight, sheetbend, reef knot</li> <li>• correct methods of coiling, sowing, and heaving of line</li> <li>• explain the points of sail</li> <li>• launch a sail boat</li> <li>• leave and return to shore safely</li> <li>• set sails associated with specific points of sail</li> <li>• demonstrate tacking and gybing</li> <li>• demonstrate the ‘heave to’ position</li> <li>• sail a basic Olympic triangle</li> <li>• demonstrate correct balance and trim</li> <li>• manoeuvre a disabled sail craft</li> <li>• apply the boating rules to practical situations</li> </ul>

## **Optional Module 24: Personal Interest Project**

**Indicative Hours: 30**

### **Description**

This module provides students with the opportunity to investigate, report and communicate their own ideas on a marine related topic which interests them. The project is an important opportunity for students to apply the skills they have acquired to solve a defined problem. The knowledge and skills needed to undertake tasks should be developed throughout the modules studied previously.

Students are expected to select their own topic based on one or more of the key areas introduced in the core units.

### **Outcomes**

A student:

- 1.1 relates with a respectful and caring attitude to the ocean and its life forms
- 1.2 identifies the roles of individuals or groups involved in maritime activities
- 1.3 recalls aspects of the maritime environment using relevant conventions, terminology and symbols learned throughout the course
- 1.4 recognises Aboriginal and Torres Strait Islander values and attitudes toward the sea
- 1.5 demonstrates an awareness of the value of the ocean as a source of historical information
- 2.1 appreciates the importance of effective management practice
- 2.3 communicates information by writing reports, giving short talks and contributing to discussions
- 3.2 collects and organises data by accurately reading instruments, signals and charts and systematically recording, summarising, tabulating and graphing.
- 3.3 generates information from data by calculating, inferring, interpreting and generalising.
- 3.4 carry out planned research activities using appropriate measurement observation, classification and recording skills

### **Notes to Teachers**

The Personal Interest Project should include a verbal presentation component.

## Optional Module 24: Personal Interest Project

<b>Students learn about:</b>	<b>Students learn to:</b>
<ul style="list-style-type: none"> <li>• collecting organising and analysing information</li>   <li>• communicating ideas and information</li>   <li>• planning and organising activities</li>   <li>• working with others and in teams</li>   <li>• using mathematical ideas and techniques</li>   <li>• using technology</li>   <li>• solving problems</li> </ul>	<ul style="list-style-type: none"> <li>• critically examine information collected from a variety of sources</li> <li>• maintain journals related to the project and to monitor progress towards completion goals</li>   <li>• explore an issue from a variety of perspectives</li> <li>• reflect on and determine how the inquiry into an issue has affected actions, values and attitudes</li>   <li>• conduct practical laboratory experiences to test ideas</li>   <li>• present peer coaching workshops to examine skill acquisition in self and others</li>   <li>• analyse areas of study by calculating flow rates, area, speed</li>   <li>• accessing information from computer databases, also the Web</li>   <li>• investigate how change may be enacted</li> <li>• draw conclusions such as ‘is change justified?’</li> <li>• determine what changes you perceive as being possible</li> </ul>

## School Developed Module(s)

### Indicative Hours: 15 or 30 hour modules

Schools may develop a maximum of one 15 hour School Developed module for each 1 Unit (60 hours) of study within the guidelines below.

The maximum hours of School Developed Modules which may be offered are:

Units and Years of Study	No. of Hours	Preliminary / HSC	Maximum School Developed Modules
1 unit / 1 year	60	60 hours Preliminary or 60 hours HSC	One 15 hour module
1 unit / 2 years	120	60 hours Preliminary plus 60 hours HSC	One 15 hour module in each year (Preliminary and HSC)  OR One 30 hour module in the HSC year only
2 units / 1 year	120	120 hours Preliminary or 120 hours HSC	Any combination of 15 and 30 hour modules up to a maximum of 60 hours.
2 units / 2 years	240	120 hours Preliminary plus 120 hours HSC	Any combination of 15 and 30 hour modules up to a maximum of 60 hours in each year (Preliminary and HSC)

### Module Description

The option of School Developed modules has been included to cater for specific local area issues or topics in relation to Marine Studies which are not covered in the syllabus Core or Optional Modules.

School Developed Modules can only be offered after completion of the Core, and must relate to a selection of the Objectives and Outcomes in Marine Studies.

Each module must clearly indicate the content in relation to what students learn about and learn to do.

## **10 Post School Opportunities**

The study of Marine Studies Stage 6 provides students with knowledge, understanding and skills that form a valuable foundation for a range of courses at university, other tertiary institutions and private providers.

In addition, the study of Marine Studies Stage 6 assists students to prepare for employment and full and active participation as citizens. In particular, there are opportunities for students to gain recognition in vocational education and training. Teachers and students should be aware of these opportunities.

### **10.1 Recognition of Student Achievement in Vocational Education and Training (VET)**

Wherever appropriate, the skills and knowledge acquired by students in their study of HSC courses should be recognised by industry and training organisations. Recognition of student achievement means that students who have satisfactorily completed HSC courses will not be required to repeat their learning in courses in TAFE NSW or other Registered Training Organisations (RTOs).

RTOs, such as TAFE NSW, provide industry training and issue qualifications within the Australian Qualifications Framework (AQF).

The degree of recognition available to students in each subject is based on the similarity of outcomes between Higher School Certificate courses and industry training packages endorsed within the AQF. Training packages are documents that link an industry's competency standards to AQF qualifications. More information about industry training packages can be found on the National Training Information Service (NTIS) website ([www.ntis.gov.au](http://www.ntis.gov.au)).

### **10.2 Recognition by TAFE NSW**

TAFE NSW conducts vocational education and training courses in an extensive range of industry areas and in general education for prevocational and foundation purposes. The details of TAFE courses are published annually in the TAFE NSW Handbook and are available on the Internet at [www.tafensw.edu.au](http://www.tafensw.edu.au)

Details of HSC/TAFE credit transfer arrangements are updated regularly on the HSC/TAFE Credit Transfer website at [www.tafensw.edu.au/hsctafe](http://www.tafensw.edu.au/hsctafe). Details of credit transfer arrangements between HSC Content Endorsed Courses and TAFE NSW are published on the website when the credit transfer arrangements are endorsed by TAFE NSW Educational Services Divisions and the Board of Studies.

Teachers should refer to the HSC/TAFE Credit Transfer website and be aware of recognition available to their students through the course of Marine Studies.

### **10.3 Recognition by other Registered Training Organisations**

Students may also negotiate recognition into a training package qualification with another Registered Training Organisation. Each student will need to provide the RTO with evidence of satisfactory achievement in Marine Studies Stage 6 CEC so that the degree of recognition available can be determined.

## 10.4 Possible Credit Transfer or Recognised Prior Learning for Core Strands and Optional Modules

Core Strands	Possible Credit Transfer/ Private Certification	Optional Modules	Hours	Possible Credit Transfer/ Private Certification
Marine Safety and First Aid (6 hours)	*	1 Resuscitation Certificate	15	*
		2 First Aid Certificate	15	*
		3 Dangerous Marine Creatures	30	
The Marine Environment (6 hours)		4 Estuarine Studies	30	
		5 Coastal Studies	30	
		6 Oceanography	15	
Life in the Sea (6 hours)		7 Local Area Study	15	
		8 Sea Birds of Our Coast	15	
		9 Commercial and Recreational	30	*
		10 Fishing	15/30	
		11 Aquaculture	15	*
Humans in Water (6 hours)	*	12 Marine Resource Management	15/30	
		13 Marine Aquarium	15/30	
		14 Anatomy and Physiology of Marine Organisms	30	
		15 Seafood Handling and Processing	30	*
Marine and Maritime Employment (6 hours)		16 Skin Diving and Diving Science	30	*
		17 Marine Engineering	30	
		18 Marine Archaeology		
Marine and Maritime Employment (6 hours)		19 Boating and Seamanship	30	*
		20 Marine Craft Construction and Repair	30	
		21 Pilotage and Navigation	15/30	*
		22 Marine Communication	30	*
		23 Wind Powered Craft	30	

## **11 Assessment and Reporting of Stage 6 Content Endorsed Courses**

### **11.1 Requirements and Advice**

The information in this section of the syllabus relates to the Board of Studies' requirements for assessing student achievement in the Content Endorsed Courses for the Higher School Certificate.

Assessment is the process of gathering information and making judgements about student achievement for a variety of purposes. Those purposes include:

- assisting student learning
- evaluating and improving teaching and learning programs
- providing evidence of satisfactory achievement and completion in the Preliminary course
- providing the Higher School Certificate results.

### **11.2 Assessment of Stage 6 Content Endorsed Courses**

There is no external examination of students in Stage 6 Content Endorsed Courses.

Assessment provides a measure of a student's achievement based on the range of syllabus content and outcomes. The assessment components, weightings and task requirements to be applied to internal assessment are identified on page 96. They ensure a common focus across schools for internal assessment in the course, while allowing for flexibility in the design of tasks. A variety of tasks should be used to give students the opportunity to demonstrate outcomes in different ways and to improve the validity and reliability of the assessment.

Schools should develop an assessment program that:

- specifies the various assessment tasks and the weightings allocated to each task
- provides a schedule of the tasks designed for the whole course.

The school should also develop and implement procedures to:

- inform students in writing of the assessment requirements for each course before the commencement of the HSC course
- ensure that students are given adequate written notice of the nature and timing of assessment tasks
- provide meaningful feedback on each student's performance in all assessment tasks
- maintain records of marks awarded to each student for all assessment tasks
- address issues relating to illness, misadventure and malpractice in assessment tasks
- address issues relating to late submission and non-completion of assessment tasks



- advise students in writing if they are not meeting the assessment requirements in a course and indicate what is necessary to enable the students to satisfy the requirements
- inform students about their entitlements to school reviews and appeals to the Board
- conduct school reviews of assessments when requested by students.

### **11.3 Assessment Components, Weightings and Tasks**

The components and weightings to be used by schools are detailed below. The allocation of weighting to particular tasks is left to the individual schools, but the percentage allocated to each assessment component must be maintained.

There should be a balance between the assessment of:

- knowledge and understanding outcomes and course content  
and
- skills outcomes and content.

<b>Course Structure</b>		<b>Core Weighting</b>	<b>Module Weighting</b>
Hours	Units		
60 hrs	1 Unit Yr11	50%	50%
60 hrs	1 Unit Yr12	50%	50%
120 hrs	1 Unit Yr11; and 1 Unit Yr 12	50% of Prelim Course only  0% of HSC Course	50% of Prelim Course  100% of HSC Course
120 hrs	2 Unit Yr11	25%	75%
120 hrs	2 Unit Yr12	25%	75%
240 hrs	2 Unit Yr11 and Yr 12	25% of Prelim Course only  0% of HSC Course	75% of Prelim Course  100% of HSC Course

One task may be used to assess several components. It is suggested that two to three tasks are sufficient to assess the HSC course outcomes for a one-unit course and three to five tasks are sufficient to assess the HSC course outcomes for a two-unit course

The assessment tasks given to students must:

- be consistent with the objectives and outcomes being assessed
- provide for a range of performances and achievements within the group
- be consistent in number with comparable 1 or 2 unit Board-developed courses
- use a range of assessment instruments. Each instrument must be appropriate to the outcomes it is designed to measure.

At least one assessment task must derive from formal examinations. Formal examinations are defined as any form of examination as used in the Higher School Certificate under conditions similar to those in the HSC for comparable tasks and which apply equally to all students at the school.

Instruments used for assessment purposes may include the following:

- short-answer tests
- essay test
- matching test
- problem-solving tests
- problem-solving assignments
- interviews
- mock trials
- seminars
- excursion reports
- diary/learning log
- internet research assignments
- critical reviews
- physical products
- class essays
- stimulus questions
- multiple-choice tests
- library research projects
- written reports on case studies, excursions, field trips, surveys
- note-making
- role plays
- debates
- oral reports
- individual/group reports
- mock interviews
- practical performances