Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE COURSE OUTLINE

MARINE AND MARITIME STUDIES

ATAR YEAR 12

Acknowledgement of Country

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

Disclaimer

Any resources such as texts, websites and so on that may be referred to in this document are provided as examples of resources that teachers can use to support their learning programs. Their inclusion does not imply that they are mandatory or that they are the only resources relevant to the course. Teachers must exercise their professional judgement as to the appropriateness of any they may wish to use.

Sample course outline
Marine and Maritime Studies – ATAR Year 12
Unit 3 and Unit 4

Science Inquiry Skills

Science Inquiry Skills align with the Science Understanding and Science as a Human Endeavour content of the unit and are integrated into the learning experiences.

- identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes
- design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics, including animal ethics
- conduct investigations, including water sampling, safely, competently and methodically for the collection of valid and reliable data
- represent data in meaningful and useful ways, including the use of mean, median, range and probability; organise and analyse data to identify trends, patterns and relationships; discuss the ways in which measurement error, instrumental accuracy, the nature of the procedure and the sample size may influence uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions
- interpret a range of scientific and media texts, and evaluate models, processes, claims and conclusions by considering the quality of available evidence, and use reasoning to construct scientific arguments
- select, construct and use appropriate representations, including biomass pyramids and life cycle diagrams, to communicate conceptual understanding, solve problems and make predictions
- communicate to specific audiences and for specific purposes, using appropriate language, nomenclature, genres and modes, including scientific reports

Semester 1

Week	Key teaching points
1–2	**Structure of the syllabus** • Course outline • Assessment outline **Concepts and skills: Snorkelling and diving** • snorkelling equipment: types, preparation, fitting and removing • pre- and post-dive care and maintenance of equipment • buddy responsibilities: pre-dive safety check, monitoring • hand signals • maritime communication systems, including underwater hand signals, from the World Recreational Scuba Training Council Guidelines (Science as a Human Endeavour) **Marine: Oceanography** • Western Australian ocean currents, including Leeuwin, West Australian and South Equatorial, and their influence on Western Australian marine ecosystems

Week	Key teaching points
3–4	**Concepts and skills and skills: Snorkelling and diving** • entry and exit techniques relevant to a natural environment • underwater swimming in a natural environment • finning: technique, direction control in a natural environment • mask defogging • clearing a partially flooded mask • snorkel breathing • snorkel clearing blast and displacement method **Marine: Oceanography** • comparisons of the production of biomass and transfer of energy in marine ecosystems, including seagrass meadows, coral reefs, mangroves and deep seas

5–7	**Concepts and skills: Snorkelling and diving**
	• duck diving, safe descending
	• descending and ascending technique
	• methods of equalising ear pressure, including
	  ▪ Valsalva
	  ▪ Frenzel
	  ▪ Toynbee
	• tired buddy tow
	• cramp release
	
	Marine: Oceanography
	• phytoplankton and zooplankton: identification, life cycles, interactions, seasonal patterns, importance to fish stocks, and measurement
	• characteristics of coral communities, including:
	  ▪ role and importance to the marine environment
	  ▪ coral bleaching process
	• ocean warming and increasing stratification will result in major changes in phytoplankton abundance, distribution and seasonal fluctuations. The Australian Continuous Plankton Recorder (AusCPR) survey observes plankton along several routes on board ships of opportunity and collects a wide variety of data. Data from the AusCPR survey and other CPR surveys, is contributing to global databases. This data is being used to inform research, conservation and marine environmental management strategies (Science as a Human Endeavour)
	
	Task 1: Science inquiry – Identifying phytoplankton and zooplankton in marine ecosystems

8–11	**Concepts and skills: Snorkelling and diving**
	• ditch and recovery of an object: weight belt
	• positive, negative and neutral buoyancy
	• establish neutral buoyancy at the surface
	• making observations while snorkelling in a natural environment
	  ▪ slates
	  ▪ photography
	
	Marine: Oceanography
	• characteristics of coral communities, including:
	  ▪ role and importance to the marine environment
	  ▪ coral bleaching process
	• impact of the enhanced greenhouse effect on:
	  ▪ coral bleaching
	
	Task 2: Practical – Snorkelling skills assessment
	Task 3: Test – Oceanography (Unit 3)

Week	Key teaching points

12–14	**Marine: Environmental and resource management**
	• major issues affecting Australia's marine environment, including:
	  ▪ declining water quality
	  ▪ loss of habitat
	  ▪ over-fishing
	  ▪ introduced species
	  ▪ ocean acidification
	• biosecurity is increasingly an issue of state and national concern. Introduced marine species (pests) and diseases pose a huge threat to Australia's marine environment. Biosecurity initiatives, including the National System for the Prevention and Management of Marine Pest Incursions (the National System), aim to prevent new pests arriving, guide responses when a new pest does arrive, and minimise the spread and impact of pests already established (Science as a Human Endeavour)
	• types of marine pollutants, including:
	  ▪ nutrient levels from human and domestic wastes
	  ▪ plastics
	  ▪ petroleum oil
	  ▪ eutrophication
	  ▪ heavy metals
	• processes used to manage and control marine pollutant problems
	Task 4: Extended response – Marine pollution

15	Examination revision
16	**Task 5: Semester 1 examination**

Semester 2

Science Inquiry Skills

Science Inquiry Skills align with the Science Understanding and Science as a Human Endeavour content of the unit and are integrated into the learning experiences.

- identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes
- design investigations, including the procedure/s to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics, including animal ethics
- conduct investigations, including longitudinal studies, safely, competently and methodically for the collection of valid and reliable data
- represent data in meaningful and useful ways, including the use of mean, median, range and probability; organise and analyse data to identify trends, patterns and relationships; discuss the ways in which measurement error, instrumental accuracy, the nature of the procedure and the sample size may influence uncertainty and limitations in data; and select, synthesise and use evidence to make and justify conclusions
- interpret a range of scientific and media texts, and evaluate models, processes, claims and conclusions by considering the quality of available evidence, and use reasoning to construct scientific arguments
- select, construct and use appropriate representations, including models of the enhanced greenhouse effect, to communicate conceptual understanding, solve problems and make predictions
- communicate to specific audiences and for specific purposes, using appropriate language, nomenclature, genres and modes, including scientific reports

Week	Key teaching points

1–4	**Marine: Environmental and resource management**
	• strategies for managing marine biodiversity, including:
	  ▪ role of marine protected areas and zones
	  ▪ global protection of cetaceans
	  ▪ role of scientific research in marine environmental management
	• ecotourism, reasons for rules and the ethical management of human interactions with whale sharks, dolphins and whales
	• a world-wide sighting and photo-identification system has been created which enables people to act as citizen scientists, assisting in the conservation of whale sharks and enhancing knowledge of the demographics of this species. The demographics of whale sharks can serve as an indication of ocean health and bio-productivity. The technology, which was developed collaboratively by a multidisciplinary team of scientists, can also potentially be used to identify other marine species (Science as a Human Endeavour)
	Task 6: Test – Environmental and resource management test

5–7	**Marine: Oceanography**
	• impact of the enhanced greenhouse effect on:
	  ▪ marine habitats and coastal communities
	  ▪ coral bleaching
	  ▪ global sea levels
	  ▪ thermohaline current

Week	Key teaching points

	• cause, effect and measurement of coastal erosion, including longshore currents, accreting and eroding beaches, deposition and sand budgets
	• features, role and impact of coastal engineering structures, including
	  ▪ physical barriers
	  ▪ sand bypass systems
	  ▪ artificial reefs
	  ▪ ports
	  ▪ canals
	• artificial reefs may be designed to assist in coastal protection and can also provide benefits to a number of different groups within the community. The benefits need to be offset against detrimental impacts to local marine ecology when the artificial reef is first introduced. Their potential to become havens for marine life in the future, resulting in increased abundance and diversity in the region, is also considered (Science as a Human Endeavour)
	
	Task 7: Practical – Coastal engineering structures
	Task 8: Extended response – The impact of climate change
	Task 9: Test – Oceanography (Unit 4)

8–10	**Concepts and skills: Snorkelling and diving** • underwater vision: the eyes, refraction, light and colour • underwater hearing: the ear, effects of water on sound • heat loss underwater: ways to reduce • pressure: effect of depth on body • Boyle's Law • barotraumas • snorkelling and diving requires knowledge of the behaviour of gases, with reference to volume and pressure. In particular, divers should understand how the volume of a gas varies with the surrounding pressure in order to prevent barotraumas. Diving equipment is designed to enhance the safety and comfort of the user and reduce the risk of dealing with gases. Materials are chosen, and equipment designed, to improve efficiency and safety (Science as a Human Endeavour) • carbon dioxide poisoning • Archimedes' principle **Task 10: Science inquiry – Boyle's Law** **Task 11: Test – Snorkelling theory**

11–14	**Maritime: History and archaeology**
	• methods of locating shipwrecks:
	  ▪ historical records
	  ▪ aerial survey
	  ▪ magnetometer
	  ▪ sonar
	• formation and decay processes associated with wreck sites (including metal corrosion)
	• underwater wreck site excavation: techniques, processing and recording, recovery of artefacts, lift bags (purpose, use and calculations)
	• conservation techniques (on-site and laboratory), including:
	  ▪ safe retrieval
	  ▪ de-concretion
	  ▪ stabilisation of wood, iron, ceramic and silver
	• in recent decades advances in science have provided new ways to locate and conserve the artefacts that are found in maritime archaeological sites (Science as a Human Endeavour)

Week	Key teaching points
	• the Batavia shipwreck, including: ▪ historical background ▪ location process ▪ survey ▪ excavation ▪ recovery ▪ conservation and interpretation of artefacts **Task 12: Science inquiry – Corrosion of iron** **Task 13: Test – Maritime history and archaeology**
15	Examination revision
16	**Task 14: Semester 2 examination**