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

SAMPLE COURSE OUTLINE

MARINE AND MARITIME STUDIES

GENERAL 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 – General Year 12
Unit 3

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.

- construct questions for investigation; propose hypotheses; and predict possible outcomes
- plan investigations, including the procedure/s to be followed, the materials required, and the type and amount of data to be collected; assess risks; and address ethical issues associated with these methods
- conduct investigations, including using ecosystem surveying techniques and line transects, safely, competently and methodically for the collection of reliable data
- represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error and inconsistencies in data; and use evidence to make and justify conclusions
- interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence
- construct and use appropriate representations, including classification keys, to communicate conceptual understanding, solve problems and make predictions
- communicate scientific ideas and information for a specific purpose, using appropriate language, nomenclature and formats, including scientific reports

Semester 1

Week	Key teaching points

1–3	**Structure of the syllabus**
	• Course outline
	• Assessment outline
	
	Marine: Oceanography
	• location and characteristics of Western Australian marine ecosystems, including:
	  ▪ estuaries
	  ▪ mangroves
	  ▪ coral reefs
	  ▪ seagrass meadows
	• classification of key species relevant to the Western Australian ecosystems studied
	• food chains and webs relevant to the ecosystems studied
	• adaptations of organisms living in mangrove ecosystems
	• construction and use of simple apparatus that can be used to measure abiotic factors of a marine ecosystem
	• methods of measuring biotic factors, such as transects and quadrats
	
	Task 1: Scientific skills – Classification of key species
	Task 2: Investigation – Measurement of biotic and abiotic factors
	Task 3: Test – Oceanography

Week	Key teaching points
4–5	**Marine: Environmental and resource management** • aquaculture as a solution to declining fish stocks • aquaculture management by Fisheries – Department of Primary Industries and Regional Development • Western Australian aquaculture regions and key species farmed • Southeast Asia has a long history of aquaculture, but rapid expansion did not start until after the mid-1970s, with the region producing a significant proportion of the world aquaculture output of food fish in terms of volume and value. Modern aquaculture technologies have been employed to raise a range of species, through a variety of methods, to meet the growing global demand for this food source (Science as a Human Endeavour) **Task 4: Extended response – Evaluation of information about WA aquaculture**
6–8	**Maritime: Design** • characteristics of maritime construction materials; for example, wood, metals, metal alloys, fibreglass, carbon fibre and plastic • maritime equipment, marine or watercraft, design and construction; for example, surfboards, boat hulls and anchors • repair process and maintenance of fibreglass craft **Task 5: Investigation – Comparing characteristics of marine construction materials** **Task 6: Practical – Construction of a model of a watercraft**
9–10	**Maritime: Small craft** • the outboard motor – basic parts, function, operating temperature, compression, horsepower • features of two-stroke and four-stroke motors • features of small craft systems, including: ▪ bilges – bilge pump ▪ electrical – batteries, fuses, spark plugs ▪ fuel – fuel lines ▪ mooring lines – fenders, care of ▪ anchoring equipment – scope, shackles • equipment care and maintenance, including: ▪ record of slippings and refits ▪ rollers and fume detectors
11–12	**Power boating: Trip planning** • boat preparation – safety equipment check, ramp etiquette, launch and recovery of a vessel • components of weather – temperature, rainfall, wind, clouds, seas and swell, storms and cyclones • marine weather forecasts – Bureau of Meteorology and other models • weather map and forecast interpretation relating to: ▪ local weather effects ▪ wind against tide or current ▪ wind strength/frontal squalls • log on, log off • chart symbols, chart types and local boating guides

Week	Key teaching points
	• accurate weather forecasting is vital to the public and private sectors; for example, to provide severe weather warnings and to inform decision-making in marine industries. There is a huge demand to increase the accuracy and reliability of weather forecasting over longer periods of time. Weather predictions are based on interpretation of changes in factors, such as air and water temperature, the direction and speed of air and water currents, humidity and atmospheric pressure. Contemporary weather predictions are informed by computer models that take into account a range of atmospheric factors but still rely on human input to determine the best forecast model, and to interpret the model data into weather forecasts that are understandable to the end user (Science as a Human Endeavour) **Task 7: Test – Trip planning**
13	**Power boating: Rules and regulations** • skipper's responsibilities and duty of care – new crew induction, sinking, breakdown, fire, grounding, health-related problems, man overboard, search for and rescue a man overboard, collision, capsize, abandon ship, grab bags, survival in water, duties of passengers/crews, code of conduct, rules, reporting of accidents • registration of vessels • port authority; licensing; recognition of operational areas and commercial regulations, including certificates of operation and certificates of competency
14–15	**Powerboating: Safety equipment** • required safety equipment (including unprotected waters, protected waters, and registrable vessels and non-registrable vessels): life jacket, visual distress signals (flares, electronic visual distress signal [EVDS], parachute flares), GPS-enabled Emergency Positioning Indicator Radio Beacon (EPIRB)/GPS-enabled Personal Locator Beacon (PLB), and marine radio (VHF, 27 MHz) • safety equipment expiry dates, care and maintenance, stowage and accessibility, safety equipment transition period (period of time to phase out old safety equipment) • recommended safety (including unprotected waters, protected waters, and registrable vessels and non-registrable vessels): bailer or bilge pump, fire extinguishers, anchors • additional safety equipment: tool kit, first aid kit, fire blanket, life buoy, torch, life raft, replacement spark plugs, chart, knife, mask and snorkel, clothing, extra lines (ropes), sunscreen, water and extra fuel • distress signals – radio (mayday, pan-pan, securite), emergency positioning indicator radio beacon (EPIRB), flares and phone **Power boating: Collision avoidance** • International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) buoyage (System A) – lateral, cardinal, special, isolated danger, safe water, wreck, marine safety signs and leads (sector light) • rules and regulations for preventing collisions within navigable waters • maritime communication systems, including distress signals and rules and regulations for avoiding collisions within navigable waters, are based on international conventions, and are subject to change through debate and resolution (Science as a Human Endeavour) **Power boating: Maintenance** • routine checks – electrical, fuel, cooling system, oil and propellers **Task 8: Externally set task**

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.

- construct questions for investigation; propose hypotheses; and predict possible outcomes
- plan investigations, including the procedure/s to be followed, the materials required, and the type and amount of data to be collected; assess risks; and address ethical issues associated with these methods
- conduct investigations, including measurement of coastal erosion, safely, competently and methodically for the collection of reliable data
- represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error and inconsistencies in data; and use evidence to make and justify conclusions
- interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence
- construct and use appropriate representations, including charts of global currents and weather patterns, to communicate conceptual understanding, solve problems and make predictions
- communicate scientific ideas and information for a specific purpose, using appropriate language, nomenclature and formats, including scientific reports

Semester 2

Week	Key teaching points
1–3	**Marine: Oceanography** • global surface ocean currents – names, locations, role in energy transfer • impacts of global atmospheric circulation systems (El Niño, La Niña) on weather patterns and nutrient upwelling • identification of cyclical changes in global atmospheric circulation systems (El Niño, La Niña) requires systematic collection and analysis of data, such as air pressure and sea-surface temperature records, to reveal patterns over time (Science as a Human Endeavour) • impact of climate change on: ▪ global sea levels ▪ thermohaline current ▪ marine habitats; for example, coral reefs • the global ocean conveyor is important in regulating global climate. Advances in remote sensing with satellites have enabled scientists to develop models of the complex pathways involved, and to measure their characteristics. The global ocean conveyor is partly driven by thermohaline circulation, the movement of water due to density changes resulting from temperature or salinity. The places where these deepwater currents are created are believed to compose less than one per cent of the ocean's surface area. Analysis of geological evidence indicates that when these vulnerable areas are disrupted, the global ocean conveyor can be 'shut down' and the world's climate can be drastically altered in just a few years. Some scientists predict that melting of the Greenland ice sheet could influence the global ocean conveyor, causing changes in global climate (Science as a Human Endeavour) • 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; for example, physical barriers, sand bypass systems • artificial reefs, ports and canals **Task 9: Test – Oceanography**

Week	Key teaching points
4–6	**Marine: Environmental and resource management** • types of marine tourism activities in Western Australia • ecotourism and its importance in the maintenance of marine area integrity • potential impacts of marine tourism, including environmental, social and economic effects

7–11	**Maritime: Design**
	• common forms of construction material protection used in marine craft, such as:
	  ▪ antifouling agents
	  ▪ sacrificial anodes
	• possible side effects of construction material protection methods; for example, copper and antifouling agents
	
	Maritime: Small craft
	• maintenance log – use, purpose
	• effect of poor marine craft maintenance on the marine environment
	• fuel and ignition – petrol/oil mix, petrol and diesel
	• cooling system – basic operation, checks, tell-tale
	• engine diagnostics
	• management of engine failure in small craft – protocols/procedures
	
	Task 10: Extended response – Protection of marine construction materials
	Task 11: Test – Maritime design and small craft

12–15	**Power boating** • operating a vessel safely • using berthing and mooring equipment • tying knots – reef, bowline, sheet bend, clove hitch, round turn and two half hitches, coiling, throwing a line, using bitts and cleats • conducting a safety briefing • preparation and starting of motors • skipper's logging on and logging off • departing the berth • performing a man overboard • driving a transit • performing a controlled stop • returning to the berth – securing a vessel **Task 12: Practical – Knot board** **Task 13: Practical – Knot tying skills assessment** **Task 14: Practical – Power boating skills test**