



Approved Innovative Course

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Course: Maritime Science I
PEIMS Code: N1304662
Abbreviation: MSC11
Grade Level(s): 9-12
Number of Credits: 1.0

Course description:

Maritime Science I provides training for entry-level employment and a basis for continuing education in deck and piloting careers and merchant mariner credentialing. Students will build on the foundational knowledge acquired in the Principles of Maritime Science course. Maritime Science I will instruct students in progressing aspects of vessel piloting and navigation, safety of life at sea, voyage planning, shipboard damage control and marine pollution. Specifically, students will understand safety expectations, laws, and environmental and human factors involved in the maritime industry. The course focuses on lab assignments and simulator experiences to reinforce critical-thinking and decision-making skills in navigation, ship handling, collision avoidance, and risk assessment and mitigation. Navigation instruction, including chart preparation, various distance, speed, and time relationships, positioning techniques, calculation of tides and currents, and voyage planning, and aids to navigation, will be explored. Students will learn basic shipboard damage control actions required in the event of shipboard casualties, search and rescue, advancements, collateral duties, and other personnel management issues.

Essential knowledge and skills:

- (a) General requirements. This course is recommended for students in Grades 9-12. Recommended prerequisite: Principles of Maritime Science. Students shall be awarded one credit for successful completion of this course.
- (b) Introduction.
 - (1) Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.



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- (2) The Transportation, Distribution, and Logistics Career Cluster focuses on planning, management, and movement of people, materials, and goods by road, pipeline, air, rail, and water and related professional support services such as transportation infrastructure planning and management, logistics services, mobile equipment, and facility maintenance.
 - (3) The Maritime Science I course is designed to prepare students for entry-level employment or continuing degrees in piloting and decking operations. Maritime Science I is designed to instruct students in advanced aspects of vessel navigation, safety, and voyage planning. Students will learn safety expectations, laws, and environmental and human factors involved in the maritime industry.
 - (4) Students are encouraged to participate in extended learning experiences such as career and technical student organizations and other leadership or extracurricular organizations.
 - (5) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.
- (c) Knowledge and Skills
- (1) The student demonstrates the employability characteristics that lead to success in the maritime industry. The student is expected to:
 - (A) identify the credentials and certification requirements for entry into careers in the maritime industry such as basic seaman, able-bodied seaman and on to captain and pilot;
 - (B) determine how to make effective decisions, use career information, and manage personal career plans;
 - (C) demonstrate the ability to use technological resources in diverse and changing personal, community, and workplace environments;
 - (D) create alternative solutions by using critical- and creative-thinking skills;
 - (E) research and compile health and safety policies, procedures, regulations, and practices of the maritime industry;
 - (F) research and discuss professional, ethical, and legal behavior consistent with applicable laws, regulations, and organizational norms; and
 - (G) demonstrate effective communication skills and leadership styles.



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- (2) The student understands the terminology and laws governing vessel navigation on navigable waters. The student is expected to:
- (A) summarize vessel regulations for international and inland waterways, such as oceans, western rivers, Great Lakes, and where each applies;
 - (B) distinguish the lines of demarcation;
 - (C) define government and industry accepted terminology and classification pertaining to vessel type, such as: power-driven vessel, sailing vessel, vessel engaged in fishing, seaplane, vessel not under command, vessel restricted in her ability to maneuver, vessel constrained by her draft, wing-in-ground underway, length, breadth, restricted visibility;
 - (D) compare the responsibilities of owner, master, and crew in regards to safe navigation and compliance with rules of the International Regulations for Preventing Collisions at Sea (COLREGS) and Inland Navigation Rules.
- (3) The student understands steering and sailing rules to prevent collision between vessels on the water. The student is expected to:
- (A) demonstrate knowledge of proper look out, speed, and traffic density in different circumstances and conditions of visibility;
 - (B) assess appropriate responses to risk of collision in various conditions and locations using proper equipment such as radar plotting and systematic observation to avoid collision;
 - (C) explain the rules for governing vessel actions and conduct during navigation of a traffic separation scheme;
 - (D) differentiate types of vessels and seaplanes based on the vessel's lights, shapes, and sounds in all weather conditions and times of day or night;
 - (E) analyze exceptions and annexes of associated navigation regulations;
 - (F) interpret aids to navigation including buoys, visual markers, lighthouses, fog signals, and day beacons and determine the action expected of each vessel;
 - (G) demonstrate skills necessary to plot position by defining a safe course considering tides and currents, aids of navigation, human structures and hazards;



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- (H) operate bridge equipment used for vessel navigation such as Electronic Chart Display and Information System (ECDIS) with integrated global positioning system (GPS), radar, Gyro Compass, bridge engineering controls, automated information systems (AIS) and very high frequency (VHF) radio; and
- (I) consider the effects of weather systems that may affect safe and efficient vessel navigation, including hurricanes, frontal systems and boundaries, fog, squall lines, microbursts, and cloud structures.
- (4) The student understands best practices in the event of an on-water collision. The student is expected to:
- (A) detail how to assess crewmembers' injuries and administer first aid as necessary;
- (B) formulate procedures for notifying the Coast Guard of the situation;
- (C) assess damage to the vessel and make repairs as necessary.
- (5) The student assesses the importance of safety in the maritime industry. The student is expected to:
- (A) identify and adhere to the Occupational Safety and Health Administration (OSHA) guidelines;
- (B) demonstrate proper use of breathing apparatus, including self-contained breathing apparatus (SCBA) and emergency egress breathing device (EEBD);
- (C) demonstrate and practice firefighting techniques using firefighting equipment, including portable systems and extinguishers;
- (D) compare the four types of shipboard fires A, B, C, D—solids, liquids, electrical and oxidizers—and identify their extinguishing agents.
- (6) The student explains safety precautions to take while handling inert gas systems on vessels. The student is expected to:
- (A) classify inert gases; and
- (B) define inert gas systems.
- (C) describe the use of and precautions need for inert gas safety systems;
- (D) diagram and label inert gas safety systems;
- (E) calculate adequate oxygen levels;
- (F) determine levels of combustible gases;



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- (G) identify toxic components of flue gases; and
 - (H) investigate chemical reactivity hazards and precautions related to vessel operations.
- (7) The student analyzes maritime environmental factors and regulations. The student is expected to:
- (A) evaluate pollution controls such as ship design, emissions, overboard discharge of solids and liquids, and waste disposal on various vessel types.
 - (B) Investigate bunkering of various vessel types, including bulk liquid cargo carriers, recreational and fishing vessels, tugs, off-shore supply vessels, and large commercial passenger vessels;
 - (C) classify the Marine Pollution (MARPOL) garbage regulations; and
- (D) outline regulations for protecting endangered and threatened marine mammals and sea life.

Description of specific student needs this course is designed to meet:

Preparing students for careers in the maritime industry is important for meeting workforce needs of the Gulf Coast regional economy. Fifty percent of the maritime workforce is 50 years of age or older and will be retiring in the near future. There is a lack of qualified workers in the expectant labor pool. Introducing maritime enterprises and possible career pathways at the high school level will create exposure and interest in the maritime field. Skills taught in these courses have been developed in collaboration with industry partners such as the Port of Houston Authority and Houston Pilots Association. After completion of a maritime career pathway, students will be able to graduate work ready with the necessary skills and qualifications for entry-level employment in the maritime industry. The purpose of the Principles of Maritime Science, Maritime Science I, and Maritime Science II courses is to provide opportunities for students to develop foundational knowledge and skills necessary for a maritime career.

Major resources and materials:

Curriculum resources are available through the following organizations:
The National Marine Educators Association- <http://www.marine-ed.org/>
National Maritime Center and Merchant Mariner Credentialing Program
<http://www.uscg.mil/nmc/>

American Association of Port Authorities- <http://www.aapa-ports.org/industry/content.cfm?ItemNumber=1076>



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The Port of Houston Authority- <http://www.portofhouston.com/community-outreach/educational-commitment/> The National Oceanic and Atmospheric Administration- <http://www.oesd.noaa.gov/> Maritime Administration (MARAD)- www.marad.dot.gov

Equipment:

Charting tools e.g., dividers, parallel ruler; time, speed, and distance wheel; charts of local area; mooring lines; deck fittings; Personal Protective Equipment (PPE) e.g., floatation suit, hard hat, life jacket, gloves

Technology:

Internet enabled device with access to ECDIS, GPS, RADAR, and AIS systems.

Textbooks:

Eaton, Jonathan. Chapman Piloting, Seamanship and Small Boat Handling. 67th ed. New York: Hearst, 2013. Print. Ford, Nathaniel B.

The American Practical Navigator. III ed. Arcata: Paradise Cay Publications, 2014. Print.

Additional Resources:

Navigation Rules and Regulations Handbook by Department of Homeland Security and United States Coast Guard <http://www.navcen.uscg.gov/?pageName=navRuleChanges>

Coordinated training with local fire department for self-contained breathing apparatus (SCBA) and other fire-fighting equipment.

Recommended course activities:

Students may be provided the opportunity to participate in some the following activities: (a) Research; (b) Career assessment and career plan development; (c) Online learning; (d) Industry speakers; (e) Interviews with industry personnel; (f) Multimedia videos; (g) Onsite visits to industry sites; (h) Written papers; (i) Written tests; (j) Tours/speakers of college campuses; (k) Hands-on experiences with industry tools tests; (l) Bridge simulations;(m) First aid skills assessment; (n) Ship channel field experiences.

Suggested methods for evaluating student outcomes:

Student outcomes will be evaluated through classroom/homework assignments, independent and group projects, and teacher-made tests and bridge-simulation/ performance-based assessments. Additionally, students will create and maintain portfolios of their work.



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Teacher qualifications:

An assignment for Principle of Maritime Science is allowed with on the of the following certificates:

- Trade and Industrial Education: Grades 6-12. This assignment requires appropriate work approval.
- Trade and Industrial Education: Grades 8-12. This assignment requires appropriate work approval.
- Vocational Trades and Industry. This assignment requires appropriate work approval.

Additional information: