



Nautical Science

CAS NS 223 (3 credits)

Course Catalog Description (max. 40 words):

Learn the fundamentals of sailing ship operation, in preparation for direct application at sea. Navigation (piloting, celestial and electronic), weather, engineering systems, safety, and sail theory. Participate as an active member of the ship's crew on an offshore voyage.

Instructor(s): Sea Education Association Nautical Science Faculty/Captains.

Location: SEA campus in Woods Hole, MA and at sea aboard a SEA sailing school vessel.

Prerequisites: Admission to SEA Semester.

Course Philosophy and Approach:

This course is part of the suite of required courses in the *SEA Semester: Marine Biodiversity and Conservation (MBC)* program. Collectively, the *MBC* courses provide the context, tools, and opportunity for students to make authentic contributions to the international effort to protect the Sargasso Sea ecosystem. This course is comprised of a 4-week shore component followed by a 5-week sea component and is dedicated to developing the practical knowledge and skills necessary for students to join the ship as active members of her crew.

The shore component syllabus will cover all the essential disciplines of the mariner: Terrestrial and Offshore Navigation, Weather, Marine Safety, and the Principles of Sailing Vessel Operation. Many of these topics will present interesting connections between basic concepts already familiar to the student, but together they represent a large volume of new material.

Once at sea, students will work under the guidance of the vessel's professional crew to build upon the fundamentals taught ashore. Under a system of progressive responsibility, students will work in stages toward the ultimate role of Junior Watch Officer (JWO), where they will assume direct control over the routine tasks of ship operations.

This course consists of 20 lecture/discussion sessions (36.5 hours combined), 2 laboratory sessions (2 hours each each), 2 exams (3.5 hours combined), and a minimum of 100 hours of supervised deck watch participation (active learning/laboratory) across ~25 underway days at sea.

Learning Outcomes:

Students will be able to . . .

1. explain the underlying principles and demonstrate the use of analog and electronic navigation instruments, including charts, compasses, GPS, radar, sextants.
2. proficiently operate the sailing vessel by applying knowledge of sail theory, stability, and sail trim for optimum performance.
3. effectively communicate and participate as part of team, in both leadership and supporting roles, to successfully accomplish the ship's mission.

Evaluation:

Final Exam	30%
Sheet Anchor	20%
Weather Observations	10%
Sea Component: Assignments	20%
Sea Component: Evaluations	10%
Deck Practical Exam	10%

Assignments:

Final Exam: Comprehensive exam covering all shore component curriculum (part I- general questions, part II- piloting & chart work).

Sheet Anchor: Each student will create their own “young sea officers” handbook that will include hand written instructions & diagrams on navigation and Nautical Science topics. This document will be a source of pertinent information that can be referenced when on the ship.

Weather Observations: Each student is responsible for daily observations (not on weekends) of several meteorological parameters: wind force, wind direction, barometric pressure, temperature, precipitation and cloud cover & type. These observations should be carried out *three* times daily, at similar times each day during the shore component. These observations provide the necessary experience for making official meteorological entries in the ship’s log book and analyzing the current weather.

Sea Component Assignments: A series of practical Celestial Navigation assignments will be completed while at sea: three sunlines, a running fix with the sun, and a star fix using at least three stars.

Sea Component Evaluations: Much of the practical learning will occur at all hours of day and night as students and crew carry out all necessary shipboard operations during deck watch. The Mates are best able to evaluate overall progress, including performance in and knowledge of daily routines and sail evolutions as well as the disposition each student brings to watch.

Deck Practical Exam: This is a practical exam to assess proficiency in critical skills once the introductory phase of the sea component is complete.

Expectations and Requirements:

- Punctual attendance is required at every class meeting.
- Active participation in class discussion is expected.
- Late assignment submissions are not accepted.
- The policy on academic accuracy, quoted below, will be strictly followed in this class.

The papers that you submit in this course are expected to be ***your original work***. You must take care to distinguish your own ideas and knowledge from wording or substantive information that you derive from one of your sources. The term “sources” includes not only published primary and secondary material, but also information and opinions gained directly from other people and text that you cut and paste from any site on the Internet.

The responsibility for learning the proper forms of citation lies with you. Quotations must be placed properly within quotation marks and must be cited fully. In addition, all

paraphrased material must be acknowledged completely. Whenever ideas or facts are derived from your reading and research, the sources must be indicated. (Harvard *Handbook for Students*, 305)

- Considerations for use of internet sources:

As you browse websites, assess their usefulness very critically. Who posted the information and why? Can you trust them to be correct? Authoritative? Unbiased? (It's okay to use a biased source as long as you incorporate it knowingly and transparently into your own work.) Keep track of good sources that might be useful for subsequent assignments, and annotate in your bibliography any sites you cite. Your annotation should include the name of the author or organization originating any material that you reference. If you can't identify the source, don't use it!

Readings:

Bowditch N. 2002. *The American Practical Navigator*, 3rd Edition. Paradise Cay Publications. 896 pp.

Chase C. 1991. *An Introduction to Nautical Science*. W.W. Norton & Company, Inc. New York, NY. 214 pp.

Cuttler TJ. 2003. *Dutton's Navigation and Piloting*, 15th Edition. Naval Institute Press, Annapolis, MD. 464 pp.

SEA (various) "Organization & Operations Manual for the Sea Component"

Course Calendar:

Topic	Readings/Assignments Due
Week 1 (5 hrs)	
MBC Program Goals and Expectations Intro. to Nautical Science & the Nautical Chart The Mariner's Compass The Navigator's Methods	Dutton Ch. 2, Sec. 201-205, 207-210 Dutton Ch. 4, Sec. 401-411 Dutton Ch. 5, Sec. 501-508, 523-536 Dutton Ch. 3, Sec. 301-313 Workbook Pages 1, 2, 3, 4 Dutton Ch. 1 Dutton Ch. 8, Sec. 801-807 Dutton Ch. 11, Sec. 1101-1109 Chase Ch. 8, 9 & 10 (pages 141-148) Workbook Pages 5, 6
Week 2 (5 hrs)	
The Running Fix Piloting Lab 1 Piloting Lab 2	Dutton Ch. 11, Sec. 1111-1112, 1118-1121 Workbook Page 15 Workbook Pages 9, 10, 12, 13 Workbook Pages 16, 17
Week 3 (3 hrs)	
Weather for the Mariner Introduction to Celestial Navigation The Mariner's Sextant	Bowditch Ch. 34 Chase Ch. 11, 13 Dutton Ch. 19, Sec. 1901-1907 Practice Reading Sextant
Week 4 (3 hrs)	
Safety at Sea Final Exam	Manual for Sea Component, p. 21-44 Practice Donning Safety Gear Sheet Anchor Due Weather Observations Due
Week 5 (35 hrs, at sea)	
Phase I: Introduction <ul style="list-style-type: none"> • Shipboard orientation • Safety and emergency management • Training: seamanship and sailhandling, navigation, food service and sanitation • Watchstanding experiences Class Topics: <ul style="list-style-type: none"> • Sextant Use • Gybing • Determining an LOP from the Sun 	

Topic	Readings/Assignments Due
Week 6 (33 hrs, at sea)	
Phase I (continued) <ul style="list-style-type: none"> Continued watchstanding experiences Task management and delegation Shadow professional crew as apprentice Class Topics: <ul style="list-style-type: none"> Running Fix – Determining ship’s position using the sun Line Chase Star Fix – Determining ship’s position using stars Set, Strike and Furl – Best Practices 	Sunlines Due
Week 8 (31 hrs, at sea)	
Phase II: Junior Watch Officer (JWO) <ul style="list-style-type: none"> Continued watchstanding experiences Advanced training in practical ship evolutions Student opportunities to assume direct oversight of ship’s operations as JWO Class Topics: <ul style="list-style-type: none"> Chase the Buoy Radar Rules of the Road 	Running Fix Due
Week 9 (29 hrs, at sea)	
Phase II (continued) <ul style="list-style-type: none"> Continued watchstanding experiences Continued JWO opportunities Class Topics: <ul style="list-style-type: none"> Marlinspike Seamanship Deck Practical 	Star Fix Due Sheet Anchor Update Due