

## 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:** At sea onboard SEA's sailing school vessel Robert C. Seamans, preceded by completion of online training modules during an initial shore preparation period.

**Prerequisites:** Admission to SEA Semester.

#### Course Philosophy and Approach:

This course is part of the suite of required courses in the *SEA Semester: Pacific Reef Expedition (PRE)*. Collectively, the *PRE* courses provide the context, tools, and opportunity for students to make authentic contributions to the international effort to understand and protect remote Pacific reef systems. This course is comprised of a 4-week on-line shore component followed by a 1-Month 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.

On-line training modules will cover 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 10 hours of on-line (live webinars, discussion forums, and associated homework) prior to sailing., 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:

On-line component	10%
Sheet Anchor	10%
Sea Component: Assignments	30%
Sea Component: Evaluations	40%
Deck Practical Exam	10%

### Assignments:

On-line component: Active participation in all on-line modules.

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.

Sea Component Evaluations: Much of your practical learning will occur at all hours of day and night as both student crew and professional 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.

Weather Observations: While at sea, each student is responsible for observations of several meteorological parameters: wind force, wind direction, sea direction, sea height, barometric pressure, temperature, precipitation and cloud cover & type. These observations are carried out *hourly* and provide necessary data for official meteorological entries in the Ship’s Log Book. This data is shared to NOAA. Our shipboard observations combine with NOAA Marine weather products to provide us with the best means to interpret and forecast our weather conditions.

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

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

### 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

NOAA PRH

NOAA

USCG

SEA

SEA

[American Practical Navigator - Bowditch](#) PDF

[NOAA Central Pacific Marine Weather, Honolulu Office](#)

[NOAA Voluntary Observing Ships Weather Handbook No. 1](#) PDF

[Navigation Rules - International & Inland](#) PDF

Organization & Operations Manual for the Shore / Sea Component, PDF

JWO Sheet Anchor, PDF

**Course Calendar:**

**Shore Preparation: April 23 – May 18, 2018**

Topic	Readings/Assignments Due
<b>Week 1</b>	(2.5 hours)
Pacific Reef Expedition	Program Goals and Expectations
Introduction to Nautical Science The Nautical Chart	Bowditch Ch. 1, sec 100 -115 Bowditch Ch. 3, sec 300, 324-347
<b>Week 2</b>	(2.5 hours)
Piloting	Bowditch Ch. 8, sec 800-822
Weather Elements and Weather Observations	Bowditch Ch. 34, Ch 36 <a href="#">NOAA Voluntary Observing Ships Weather Handbook No. 1</a> PDF
<b>Week 3</b>	(2.5 hours)
Introduction to Celestial Navigation	Bowditch Ch 15; Ch 16, sec 1600-1609; Ch. 20, sec 2013
Safety at Sea	SEA Manual for Sea Component, p. 21-44
<b>Week 4</b>	(2.5 hours)
Preparing for Sea	Essay Due 18 May by 2359 Hawaii Standard Time <b><u>"Going to Sea"</u></b>

**Sea Component: May 23 – June 24, 2018**

<b>Week 1 (30 hrs, at sea)</b>	
Phase I: Introduction <ul style="list-style-type: none"> <li>• Shipboard orientation</li> <li>• Safety and emergency management</li> <li>• Training: seamanship and sail handling, navigation, food service and sanitation</li> <li>• Watchstanding experiences</li> </ul> Class Topics: <ul style="list-style-type: none"> <li>• Sextant Use</li> <li>• Gybing</li> <li>• Determining an LOP from the Sun</li> </ul>	

Topic	Readings/Assignments Due
<b>Week 2 (30 hrs, at sea)</b>	
Phase II <ul style="list-style-type: none"> <li>Continued watchstanding experiences</li> <li>Task management and delegation</li> <li>Shadow professional crew as apprentice</li> </ul> Class Topics: <ul style="list-style-type: none"> <li>Running Fix – Determining ship’s position using the sun</li> <li>Line Chase</li> <li>Star Fix – Determining ship’s position using stars</li> <li>Set, Strike and Furl – Best Practices</li> </ul>	<b>Sunlines Due</b>
<b>Week 3 (30 hrs, at sea)</b>	
Phase III: Junior Watch Officer (JWO) <ul style="list-style-type: none"> <li>Continued watchstanding experiences</li> <li>Advanced training in practical ship evolutions</li> <li>Student opportunities to assume direct oversight of ship’s operations as JWO</li> </ul> Class Topics: <ul style="list-style-type: none"> <li>Leaders, Managers, and team members</li> <li>Marlinspike Seamanship</li> <li>Deck Practical</li> </ul>	<b>Running Fix Due</b>
<b>Week 4 (30 hrs, at sea)</b>	
Phase III (continued) <ul style="list-style-type: none"> <li>Continued watchstanding experiences</li> <li>Continued JWO opportunities</li> </ul> Class Topics: <ul style="list-style-type: none"> <li>Cultivation of Navigation Skills</li> <li>Mission</li> </ul>	<b>Star Fix Due</b>
<b>Week 5 (20 hrs, at sea)</b>	
Phase III (continued) <ul style="list-style-type: none"> <li>Continued watchstanding experiences</li> <li>Continued JWO opportunities</li> </ul> Class Topics: <ul style="list-style-type: none"> <li>Chase the Buoy</li> <li>Radar</li> <li>Rules of the Road</li> </ul>	<b>Sheet Anchor Update Due</b>