

## TEACHING SYLLABUS

NAUT 001ax: Nautical Science: COURSE TEACHING SYLLABUS

Crew Level: 2 (semester) academic units

*(Course is for credit, but not degree credit for certain majors-check w/ your advisor)*

Website: [www.usc.edu/sppd/naut](http://www.usc.edu/sppd/naut)

### General Information

No Prerequisite

Instructors: Capt. Lars Harding, Program Administrator  
Capt. Noah Peffer  
Capt. Paul Prioleau  
Capt. John Ugoretz

Text: The Annapolis Book of Seamanship, J. Rousmaniere  
Video: Cruising Under Sail

Charts: 1210TR Martha's Vineyard to Block Island (optional)  
18746 Catalina Channel (optional)  
18751 Los Angeles Harbor (optional)

Office: P.E.D. 104  
Capt. Harding Mondays - 1:15PM and Weds - 5:15 PM-5:45PM  
Capt. Ugoretz, Tuesdays when lecture is given - 5:15-5:45 PM

Grading Policy: Nautical Science classes include five class lectures, a dockside demonstration, a sailing voyage, and a review session at the end of the semester. Students must attend all lectures as well as the other events, as they contribute to the academic concepts and skills tested on the final exam, which accounts for 90% of the course grade. The final exam covers seamanship skills and navigation chart work, 50% each area, and is administered according to the University published final exam schedule. Students who sign up for an event and do not attend without making prior arrangements are subject to possible grade reduction. Class attendance is required in order to participate in two-day sailing voyage.

**USC Statement on Academic Standards: <http://arr.usc.edu/services/curriculum/resources.html>**

Vessels used: 52' traditional sailing schooner and 40'-36' modern cruising sloops

Meeting Periods:

Classroom: 16 lecture hours and 3-hour review session

Practical: 16 hours onboard including lecture and applied skills  
16 hours non-structured time aboard

Dockside Demonstration: 3 hours

### Course Syllabus

#### Seamanship Theory

- I. Basic Nomenclature of a Sailing Vessel
  - A. Hull nomenclature
    1. Hull types
      - a. displacement hulls
      - b. planing hulls
    2. Hull measurement

3. Theoretical hull speed
4. Types of hull shapes
5. Freeboard and topsides
- B. Rigging nomenclature
  1. Standing rigging
    - a. forestays, jib stays, head stays
    - b. shrouds
    - c. backstays--permanent and running
  2. Running rigging: systems and operation
    - a. halyards
    - b. sheets
- II. Basic Types of Sailing Vessels and Their Operation
  - A. Sloop
  - B. Ketch
  - C. Yawl
  - D. Schooner
- III. Sailing Vessel Sails
  - A. Types and parts of sails
  - B. Jib-headed and gaff-headed sails
  - C. Loose footed/club footed jibs
- IV. Sailing positions
  - A. Beat
  - B. Close reach
  - C. Beam reach
  - D. Broad reach
  - E. Run
- V. Sailing maneuvers
  - A. Coming about
  - B. Jibing
- VI. Tacking for specific points
- VII. The problem of being in irons
  - A. Causes and prevention
  - B. Securing a specific tack
- VIII. Leeway and Course Heading
- IX. Centerboard and Daggerboard operations
- X. Aerodynamics of sail
  - A. Venturi/Bernoulli effect
  - B. Newton's Third Law of Motion
  - C. Signs in sails--given course and wind affecting sail adjustment
- XI. Reefing
  - A. Reefing techniques and functions
  - B. Reefing equipment
- XII. Basic mooring and anchoring theory
- XIII. Docking techniques and functions
- XIV. Marlinspike seamanship
  - A. Coiling and heaving lines
  - B. Basic knots and their functions
  - C. Types of line and their functions
- XV. Basic rules of the road
  - A. Power vessels
  - B. Sailing vessels

XVI. Watch station overview: Crew

Navigation Theory

- I. Charts
  - A. Scales and charts
  - B. Chart agencies and ordering
  - C. Soundings and depth findings
- II. Chart symbols and aids to navigation
  - A. Lighted and unlighted markers
  - B. Major beacons and their signals
  - C. Aids to navigation in a channel
- III. Definition of position: Latitude and longitude determination
- IV. Measurement of speed (knots); Distance and time calculation
- V. Errors in the magnetic compass
  - A. Variation
  - B. Deviation
- VI. Plotting a course (headings and distances)
- VII. Bearings, L.O.P.'s and fixes

Practical Offshore Sailing Operations During Two-Day Catalina Voyage

Operations Day 1:

- 1. Vessel operational orientation--review of sail handling
- 2. Safety equipment: EPIRB, raft, life jackets, distress signals, VHF use emergency channel 16, fire fighting equipment, GPS man overboard function
- 3. Navigation orientation--dockside fix, course and distances for entire voyage, AIS, GPS and radar orientation
- 4. Beam bearing procedures between helmsman and navigator for the purpose of starting/recording ship's speed log
- 5. Use of lines and fenders while initiating vessel underway from dock
- 6. Underway speed/log check and ship's compass check
- 7. Navigational fix in harbor coordinated with depth finder and GPS
- 8. Procedures of sail raising without the use of engine
- 9. Demonstration of vessel sail balance with regard to raising, lowering sails and steering
- 10. Demonstration of vessel in irons and techniques for obtaining desired given tack
- 11. Procedures in starting an offshore voyage
- 12. Techniques of refined sail trim
- 13. Operational ship's watch procedures (navigation watch/deck watch)
- 14. Man made and natural ranges
- 15. Right of way review
- 16. Collision bearings
- 17. Steering by compass and landmark
- 18. speed-time-distance problems
- 19. Determining vessel speed by timing passing object
- 20. Predicting ETA
- 21. Techniques of sail lowering and furling
- 22. Mooring procedures

Operations Day 2:

1. GPS and radar interface demonstrated
2. Demonstration of the use of ship's radio: U.S. Coast Guard emergency channel 16, bridge to bridge channel 13, weather information channels, placing telephone calls with local marine operators
3. Use of the Automatic Identification System (AIS) and Global Positioning System (GPS)
4. Reorientation of new students aboard
5. Techniques of leaving a mooring
6. Steering and maneuvering a vessel in limited quarters
7. Standard coastal navigation along north shore of Catalina
8. Use of bow beam bearings to indicate distance off a mark; check by radar and GPS
9. Discussion of Catalina anchorages with regard to local weather
10. Techniques of sail balance in reefing, heaving to and running before heavy winds and seas
11. Navigational turn bearings
12. Location of submarine canyon by use of depth finder coordinated with ETA/speed, time, and distance problems
13. Determination of ship's speed by timing passage of object thrown overboard
14. Rights of way, collision course determination at sea by AIS, visual bearing, radar bearing and sound bearing in fog
15. Docking

CNET Skills Profile for Crew Level Course (301a)

Mission: to train a student in the fundamentals of sailing theory, marlinspike seamanship, ship handling and rules of the road. Upon completion of the course, the student will be able to perform the duties of crewman on an offshore sailing vessel as outlined in Offshore Sail Training Manual P1552/1 (Series) and in accordance with the applicable sail training manual(s). Chief of Naval Education and Training.

Profile Statements: Tasks Taught

1. Identify lines, rigging and sails on a sailboat using standard nomenclature
2. Identify standing and running rigging associated with the use of sails
3. Identify common sailing rigs
4. Analyze the forces applicable to the aerodynamics of sails
5. Locate and identify sailing vessel safety equipment and running rigging.
6. Identify basic principles and skills of marlinspike seamanship
7. Identify the use of the square knot, bowline, clove hitch, stopper knot, and half hitch
8. Identify the function of mooring system components
9. List the sequence of steps for anchoring a sailing vessel
10. Identify ground tackle associated with a sailing vessel anchoring
11. Trim sails for each point of sail
12. Identify environmental and inherent factors associated with ship handling
13. Assist in mooring a sailing vessel
14. Assist in anchoring a sailing vessel
15. Identify terms and definitions associated with Rules of the Road
16. Identify lights required by Rules of the Road for sail and power vessels
17. Identify crewman watch station requirements for an offshore sailing vessel
18. Maneuver a sailboat to each of the four points of sail
19. Chart reading and basic navigation
20. Safety systems