SEMESTER AT SEA COURSE SYLLABUS

Colorado State University, Academic Partner

Voyage: Fall 2018
Discipline: Astronomy
Course Number and Title: AA 100 Introduction to Astronomy
Division: Lower
Faculty Name: Benjamin R. Jordan
Semester Credit Hours: 3

Prerequisites: None

COURSE DESCRIPTION

Astronomy can be considered one of the world’s oldest sciences. Since ancient times, humanity has looked to the night sky for inspiration and tried to make sense of the universe. In this class, we will explore our modern understanding of the nature of galaxies, stars, and planetary bodies. The course will also cover the history of how our understanding of the night sky, the objects in it, and Earth’s place in the universe has changed due to scientific inquiry and discovery. Taking this class during Semester at Sea will provide students with a unique opportunity to see the night sky of both the Northern AND Southern hemispheres during the same semester. In addition, the ship will travel in the open ocean, far from the light pollution so common to the modern world, making it possible to taste the wonder that ancient peoples may have felt as they looked at the night sky.

LEARNING OBJECTIVES

By the end of the semester students should, at a minimum, be able to do the following:

- Know how to make astronomical observations and understand the various methods and tools used by astronomers.
- Understand how and why humanity’s view of the universe, and Earth’s place in it, has evolved over time.
- Understand the nature of “deep time” and the scale of the universe.
- Understand how the universe formed and the timeline of its history to the present.
- Know how galaxies form and evolve and how they were discovered.
- Understand the life cycle of stars – how stars form, how they change, how they generate light and other forms of energy, and how they eventually transform.
- Understand the global impacts of our own star (the Sun).
• Understand the nature of solar systems, how they form, and their common characteristics and relationships.
• Understand the basic nature of light, gravity, dark matter, and dark energy – and what they tell us about the universe.

REQUIRED TEXTBOOKS

AUTHOR: Eric Chaisson and Steve McMillan
TITLE: Astronomy: A Beginner's Guide to the Universe
PUBLISHER: Jones & Bartlett Learning
ISBN #: 9780134087702
DATE/Edition: 2017 / 8th

Students are required to bring:

1. Pencils (wooden or mechanical) – NOT pens
2. A small set of colored pencils (at least 12 count).
3. A Notebook. It is recommended that students purchase this one: Rite in the Rain notebook (4 5/8” x 7”, spiral bound): https://www.amazon.com/Rite-Rain-All-Weather-Side-Spiral-973T/dp/B009F1E28G/ref=sr_1_4?ie=UTF8;qid=1505863728&sr=8-4&keywords=rite%2Bin%2BRAIN&th=1

Additional resources and texts will be made available onboard ship.

TOPICAL OUTLINE OF COURSE

Depart Hamburg, Germany — September 9

B1—September 12: Introduction, Course Nuts and Bolts
What is astronomy?
Overview of astronomy and maritime travel.

B2—September 14: Telescopes: The Tools of Astronomy (Chapter 3 in textbook)
Preparation for Spain: Spanish astronomy and observatories
(supplemental readings)

Barcelona, Spain — September 15-16
Valencia, Spain — September 17-18

B3—September 20: Charting the Heavens: The Foundations of Astronomy (Chapter 0 in textbook)

B4—September 22: The Copernican Revolution: The Birth of Modern Science (Chapter 1 in textbook)
Study Day — September 23: No Class

B5—September 25: Exam 1
Preparation for Ghana: Astronomy in Africa (Supplemental readings)

Tema, Ghana — September 27-28
Takoradi, Ghana — September 29-30

B6—October 1: Light and Matter: The Inner Workings of the Cosmos (Chapter 2 in textbook)

Community Programming — October 2: No Class

B7—October 4: The Solar System: Interplanetary Matter and the Birth of the Planets (Chapter 4 in textbook)

The birth of a solar system from a nebula. After NASA.

B8— October 6: Earth and Its Moon: Our Cosmic Backyard (Chapter 5 in textbook)
Preparation for South Africa: The South African Astronomical Observatory (Supplemental readings)

Cape Town, South Africa — October 7-12

B9—October 14: The Terrestrial Planets: A Study in Contrasts (Chapter 6 in textbook)

Study Day —October 16: No Class

B10—October 17: The Jovian Planets: Giants of the Solar System (Chapter 7 in textbook)
Preparation for Mauritius: Ancient Peoples and Celestial Navigation
(“Development of Astronomy in Mauritius” and other supplemental readings)

Since ancient times mariners have navigated across vast areas of the ocean. They moved from one continent or island to another – mostly using the stars to navigate.

BYU-Hawaii’s Iosepa – a Polynesian voyaging canoe (BYUH)

Port Louis, Mauritius — October 19

B11—October 20: Moons, Rings, and Plutoids: Small Worlds among Giants (Chapter 8 in textbook)

Study Day —October 21: No Class

B12—October 23: Exam 2
Preparation for India: Hindu Cosmology (Supplemental readings)

Cochin, India — October 25-30

Reflection & Study—October 31: Global Studies Reflection

B13— November 1: The Sun: Our Parent Star
Measuring the Stars: Giants, Dwarfs, and the Main Sequence (Chapter 10 in textbook)

B14—November 3: The Interstellar Medium: Star Formation in the Milky Way (Chapter 11 in textbook)
Preparation for Myanmar: Buddhist Cosmology (Supplemental readings)

Yangon, Myanmar — November 4-8

B15—November 10: Stellar Evolution: The Lives and Deaths of Stars (Chapter 12 in textbook)

Community Programming — November 11: No Class

B16—November 13: Neutron Stars and Black Holes: Strange States of Matter (Chapter 13 in textbook)
Preparation for Vietnam: “Astronomy in Vietnam” (Supplementary Readings)

Ho Chi Minh City, Vietnam — November 14-18

B17—November 20:  Exam 3
The Milky Way Galaxy: A Spiral in Space (Chapter 14 in textbook)

Study Day — November 21: No Class

B18—November 23: Preparation for China: The Long History of Chinese Astronomy
(Supplemental readings)

Shanghai, China — November 24-29

B19—December 1:  Preparation for Japan: Astronomy and Mythology in Japan
(Supplemental readings)

Kobe, Japan — December 2-6

Protoplanets in the Orion Nebula. After NASA.

B20—December 8:  Normal and Active Galaxies: Building Blocks of the Universe (Chapter 15 in textbook)

B21—December 10: Galaxies and Dark Matter: The Large-scale Structure of the Cosmos
(Chapter 16 in textbook)

B22—December 12: Cosmology: The Big Bang and the Fate of the Universe (Chapter 17 in textbook)

Honolulu, Hawaii — December 16

B24—December 17: Life in the Universe: Are We Alone? (Chapter 18 in textbook) Course review and discussion.

Study Day — December 18: No Class

B24—December 20: Final Exam

Arrive San Diego, California — December 23

FIELD WORK

Semester at Sea field experiences allow for an unparalleled opportunity to compare, contrast, and synthesize the different cultures and countries encountered over the course of the voyage. In addition to the one field class, students will complete independent field assignments that span multiple countries.

Field Class & Assignment
The field class for this course is on Saturday, 18 September in Valencia, Spain.

Field Class attendance is mandatory for all students enrolled in this course. Do not book individual travel plans or a Semester at Sea sponsored trip on the day of your field class. Field Classes constitute at least 20% of the contact hours for each course, and are developed and led by the instructor.

Field Class Location: Valencia. Field excursion to the Sky Classroom at Observatori Astronomic

Part 1

Northeastern Spain is renowned as one of the best astronomical viewing areas in Europe. This excursion will give students the opportunity to visit and explore astronomy exercises in Valencia.

On prior voyages, the astronomy field class has involved students making observations at sea. This will still be done during this voyage, but it turns out that there is an opportunity for students to also experience land-based astronomical exercises while in Valencia, Spain.

Being able to visit these locations of modern astronomy early in the voyage will help lay the foundation for what students will learn throughout the rest of the semester and give context to the knowledge and information covered in class.
Assignments

Students will be required to take field notes and photographs of their experience. From these notes and photographs, the students will be required for complete a report of their trip as they answer the following questions:

1. Describe your astronomy field excursion, where did you go, what did you learn?
2. How have your own views of astronomy changed or been effected by what you’ve learned on the excursion?

Part 2

Throughout the voyage, students will be required to prepare an astronomical log in which they record at least 2 hours’ worth of astronomical observations, including the date, time, and ship’s location. These 2 hours will include the following:

- 2 Hours of attendance at ship-wide astronomy presentations that will be arranged. These presentations will cover a variety of astronomy subjects and will occur at least four times. Two of them will occur in association with the Orionids Meteor Shower (October 21-22) and the Geminids Meteor Shower (December 13-14).

- During these presentations, students will be required to complete the following assignments:
  - Observe, sketch, and identify the major features of the moon.
  - As part of their log, they will record, at regular intervals, changes in the relative heights of the Polaris (the North Star) and the Southern Cross constellation above the horizon.

These nighttime labs will generally occur between 20:00 and 21:00, subject to approval by the ship’s captain and his staff (and the weather). With the approval of the captain the ship’s lights will be turned off for this time period to allow improved viewing of the night sky.

Also, during these nighttime labs, students will learn, amongst other things, to recognize the major constellations of the Northern and Southern Hemispheres; the positions and motion of many of the planets; the Magellanic clouds; star evolution and color; star clusters; and nebulae.

- Over the course of the semester, within their log, students will also make multiple observations of the location of sunrise and sunset relative to the cardinal points of the compass.

Independent Field Assignments
Ports-of-Call Report: Students are assigned to make note of astronomy-related subjects or features in all of the ports-of-call relative to the local culture and/or history. The features/subjects can include architecture, art, cultural and religious beliefs, etc., but the students are welcome note other, non-traditional references to astronomy. At the end of each port-of-call visit, students are required to submit a short paragraph of what they observed.

At the end of the semester students are required to write a 5-page essay discussing their interpretation of the connection, or lack of connection, between their observations and the material discussed in the class. The theme of the paper will be: “Astronomy in Human Culture.” Students will be graded on how well they present their observations and relate it to the course material.

Classroom Assignments/Labs

Throughout the semester students will be required to complete reading and homework assignments. Each reading assignment will include a quiz that will require completion BEFORE coming to class.

Homework assignments will be explained and assigned in class.

METHODS OF EVALUATION / GRADING SCALE

The following Grading Scale is utilized for student evaluation. Pass/Fail is not an option for Semester at Sea coursework. Note that C-, D+ and D- grades are also not assigned on Semester at Sea in accordance with the grading system at Colorado State University (the SAS partner institution).

Pluses and minuses are awarded as follows on a 100% scale:

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Good</th>
<th>Satisfactory/Poor</th>
<th>Failing</th>
</tr>
</thead>
<tbody>
<tr>
<td>97-100%: A+</td>
<td>87-89%: B+</td>
<td>77-79%: C+</td>
<td>Less than 60%: F</td>
</tr>
<tr>
<td>93-96%: A</td>
<td>83-86%: B</td>
<td>70-76%: C</td>
<td></td>
</tr>
<tr>
<td>90-92%: A-</td>
<td>80-82%: B-</td>
<td>60-69%: D</td>
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A student’s grade will be calculated based on the total number of points that they earn on assignments, exams, etc. as a percentage of the total number of points available in the class. Whatever percentage of points that the students earn, that will determine their grade based on the scale above. However, as a general note, the following is an estimate of the percentage of a student’s final grade contributed by each assignment:

Exams (including Final) – 40%
Field Class/Field Assignments (Ports-of-Call Report and Astronomy Logbook/Labs) – 30%
Reading Quizzes – 15%
Participation and Attendance – 15%
ATTENDANCE/ENGAGEMENT IN THE ACADEMIC PROGRAM

Attendance in all Semester at Sea classes, including the Field Class, is mandatory. Students must inform their instructors prior to any unanticipated absence and take the initiative to make up missed work in a timely fashion. Instructors must make reasonable efforts to enable students to make up work which must be accomplished under the instructor’s supervision (e.g., examinations, laboratories). In the event of a conflict in regard to this policy, individuals may appeal using established CSU procedures.

LEARNING ACCOMMODATIONS

Semester at Sea provides academic accommodations for students with diagnosed learning disabilities, in accordance with ADA guidelines. Students who will need accommodations in a class, should contact ISE to discuss their individual needs. Any accommodation must be discussed in a timely manner prior to implementation.

A letter from the student’s home institution verifying the accommodations received on their home campus (dated within the last three years) is required before any accommodation is provided on the ship. Students must submit this verification of accommodations to academic@isevoyages.org as soon as possible, but no later than two months prior to the voyage.

STUDENT CONDUCT CODE

The foundation of a university is truth and knowledge, each of which relies in a fundamental manner upon academic integrity and is diminished significantly by academic misconduct. Academic integrity is conceptualized as doing and taking credit for one’s own work. A pervasive attitude promoting academic integrity enhances the sense of community and adds value to the educational process. All within the University are affected by the cooperative commitment to academic integrity. All Semester at Sea courses adhere to this Academic Integrity Policy and Student Conduct Code.

Depending on the nature of the assignment or exam, the faculty member may require a written declaration of the following honor pledge: “I have not given, received, or used any unauthorized assistance on this exam/assignment.”

ELECTRONIC COURSE MATERIALS

In addition to the course textbook, multiple articles and videos will be assigned and accessible through the course page on the ship’s intranet.

These materials are meant to round out the course and provide students with additional knowledge and insights into the science of astronomy.
ADDITIONAL RESOURCES

Recommended for students to obtain BEFORE coming onboard:

1. Sky Map app (by Sky Map Devs)
2. Stellarium software (downloadable for free from: http://stellarium.org/)
3. A small pair of binoculars