

## SEMESTER AT SEA COURSE SYLLABUS

Colorado State University, Academic Partner

|                                 |   |
|---------------------------------|---|
| <b>Voyage:</b>                  | Spring 2019   |
| <b>Discipline:</b>              | Natural Resources                                       |
| <b>Course Number and Title:</b> | NR/BZ 353 Global Change Ecology, Impacts and Mitigation |
| <b>Division:</b>                | Upper   |
| <b>Faculty Name:</b>            | Susan Sherrod   |
| <b>Semester Credit Hours:</b>   | 3   |

**Prerequisites:** One (1) fundamentals of ecology course

### COURSE DESCRIPTION

This course is designed for students who understand basic ecology concepts and are prepared to objectively examine the complicated issues surrounding global change ecology. We will cover the following major themes:

- **Science and Impacts:** We will use peer-reviewed scientific studies and the IPCC Fifth Assessment Report to explore current understandings of and trends in global change ecology. After reviewing the basics of the global carbon budget and hydrology, we will evaluate climate impacts on oceans, terrestrial animal and plant populations, soils, invasive species, and disturbance regimes.
- **Management Responses:** Conservation, adaptation, and mitigation will guide our discussions of land use strategies, species protection and reintroductions, alternative energy planning, and practical scales of management action. We also will explore lessons learned to date.
- **Politics, Policy, and Culture:** This theme will scratch the surface of how global change affects economies, human health, public opinion and behavior, and policy. Facilitated class discussions will be a central tool of this section.

Because global change ecology has multidisciplinary implications, we welcome the perspectives of students with non-science majors.

### LEARNING OBJECTIVES

1. Understand the scientific basis, and with historic and potential ecological effects, of global climate change.
2. Be familiar with adaptation and mitigation responses and able to analyze their effectiveness.
3. Apply knowledge of global change principles and management responses to case studies as presented by the itinerary of the voyage.

- Advocate for a vulnerable ecosystem by crafting persuasive arguments on their behalf for outside support.

## REQUIRED TEXTBOOKS

AUTHOR: Lee Hannah  
 TITLE: Global Change Biology  
 PUBLISHER: Elsevier  
 ISBN #: 9780127999234  
 DATE/EDITION: 2014/2<sup>nd</sup>

AUTHOR: Intergovernmental Panel on Climate Change (IPCC)  
 TITLE: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)].  
 PUBLISHER: IPCC, Geneva, Switzerland  
 ISBN #: n/a  
 WEB: <https://www.ipcc.ch/report/ar5/syr/>  
 DATE/EDITION: November 2014

## TOPICAL OUTLINE OF COURSE

| Lecture Number/<br>Date                                | Topics   | Reading <sup>1</sup> / Assignment        |
|--|--|--|
| <b>Depart Ensenada, Mexico – January 5</b>             |  |  |
| <b>B1</b><br>Jan 8                                     | Introductions, Course overview<br>Lecture: The Scientific Basis of Global Change           | Ch 1-2                                   |
| <b>B2</b><br>Jan 10                                    | Lecture: Great Pacific Garbage Patch; Global Change Realities in Hawai'i and Other Islands | Gall and Thompson 2015                   |
| <b>Honolulu, Hawai'i – January 12</b>                  |  |  |
| <b>B3</b><br>Jan 13                                    | Hawai'i Debrief<br>Lecture: IPCC overview, Species Range Shifts                            | Walther et al. 2002; IPCC pp.36-54; Ch 3 |
| <b>B4</b><br>Jan 15                                    | Lecture: Phenology and Ecosystem Changes   | Ch 4-5                                   |
| January 16–International Date Line crossing (Lost Day) |  |  |
| <b>B5</b><br>Jan 18                                    | Lecture: The Global Carbon cycle   | Ch 19                                    |
| Study Day (No Class) – January 19                      |  |  |
| <b>B6</b><br>Jan 21                                    | Lecture: Historic Terrestrial Responses to Climate Change                                  | Ch 6                                     |
| <b>B7</b><br>Jan 23                                    | Lecture: Historic Marine Responses to Global Change; Global Change Realities in Japan      | Ch 7                                     |

<sup>1</sup> "Ch" refers to Hannah (2014), "IPCC" refers to IPCC 2014

| Lecture Number/<br>Date                               | Topics  | Reading <sup>1</sup> / Assignment                             |
|---|---|---|
| <b>Kobe, Japan – January 24-28</b>                    |   |   |
| <b>B8<br/>Jan 30</b>                                  | Japan Debrief<br>Lecture: Historic Freshwater Responses to Global Change; Global Change Realities in China                                    | Ch 8; Dudgeon 2010  |
| <b>Shanghai, China – January 31 - February 1</b>      |   |   |
| In Transit – February 2-3                             |   |   |
| <b>Hong Kong, SAR – February 4-5</b>                  |   |   |
| <b>B9<br/>Feb 7</b>                                   | China Debrief<br>Lecture: Species Extinctions; Global Change Realities in Vietnam   | Ch 9; The Sixth Extinction<br>Chs 3 and 10                    |
| <b>Ho Chi Minh City, Vietnam – February 8-13</b>      |   |   |
| <b>FIELD TRIP February 13 (Day 6)</b>                 |   |   |
| <b>B10<br/>Feb 15</b>                                 | Vietnam Debrief<br>Student presentations: Hawai'i-Japan-China comparisons<br>Lecture: Overview of Projected Risks and Impacts                 | IPCC pp. 56-73  |
| <b>Community Programming (No Class) – February 16</b> |   |   |
| <b>B11<br/>Feb 18</b>                                 | Lecture: Global Change Research – Experimentation and Modeling; Global Change Realities in Myanmar  | Ch 10-11  |
| <b>Yangon, Myanmar – February 19-23</b>               |   |   |
| <b>B12<br/>Feb 25</b>                                 | Myanmar Debrief<br>Lecture: Estimating Extinction Risk  | UNDP proposal draft due (exchange for peer reviews);<br>Ch 12 |
| <b>B13<br/>Feb 27</b>                                 | Lecture: Ecosystem Services; Global Change Realities in India   | Ch 13   |
| <b>Cochin, India – February 28 - March 5</b>          |   |   |
| <b>Community Programming (No Class) – March 7</b>     |   |   |
| <b>B14<br/>Mar 8</b>                                  | India Debrief<br>Lecture: Conservation Strategies and Landscape Management  | UNDP proposal (+ reviewed draft) due; Ch 14-15                |
| <b>B15<br/>Mar 10</b>                                 | Student presentations: Vietnam-Myanmar-India comparisons<br>Lecture: Restoration Ecology; Global Change Realities in Mauritius                | Paper TBD   |
| <b>Port Louis, Mauritius – March 11</b>               |   |   |
| <b>B16<br/>Mar 13</b>                                 | Mauritius Debrief <sup>2</sup> , discussion of assignment<br>Lecture: Future Pathways for Adaptation, Mitigation, and Sustainable Development | IPCC pp. 75-91  |

<sup>2</sup> May take longer than usual if restoration project is done

| Lecture Number/<br>Date                             | Topics  | Reading <sup>1</sup> / Assignment   |
|---|---|-------------------------------------|
| B17<br>Mar 15                                       | Lecture: Species Management   | Ch 16                               |
| B18<br>Mar 17                                       | Lecture: Reducing Greenhouse Gas Emissions, Sinks, and Solutions; Global Change Realities in Cape Town                              | Ch 18                               |
| <b>Cape Town, South Africa – March 18-23</b>        |   |                                     |
| B19<br>Mar 25                                       | South Africa Debrief<br>Lecture: Assessing Risks and Designing Solutions  | Ch 20                               |
| B20<br>Mar 27                                       | Lecture: A History of Climate Change Policy   | IPCC 93-112                         |
| B21<br>Mar 29                                       | Lecture: Global Change Realities in Ghana<br>Students: Short descriptions of reversal strategies                                    | <u>Drawdown</u> (self-select topic) |
| <b>Takoradi, Ghana – March 30 - April 1</b>         |   |                                     |
| <b>Tema, Ghana – April 2-3</b>                      |   |                                     |
| B22<br>Apr 5  | Ghana Debrief<br>Students: Short descriptions of reversal strategies  | <u>Drawdown</u> (self-select topic) |
| B23<br>Apr 7  | Lecture: Policy and Politics of Global Climate Change   | Ch 17                               |
| <b>Study Day (No Class) – April 8</b>               |   |                                     |
| B24<br>Apr 10                                       | Student presentations: Mauritius-South Africa-Ghana comparisons<br>Lecture: Global Change Realities in Morocco;<br>Review for Final | -                                   |
| <b>Casablanca, Morocco – April 11-15</b>            |   |                                     |
| <b>Study Day (No Class) – April 16</b>              |   |                                     |
| B25<br>Apr 18                                       | Morocco Debrief   | Final Exam                          |
| <b>Arrive Amsterdam, The Netherlands – April 21</b> |   |                                     |

## 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.

The field class for this course is on **Tuesday, February 13<sup>th</sup>, in Ho Chi Minh City, Viet Nam**. Note that this is the last day (Day 6) of our time in port. **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 Title:** Climate Change Adaptation at C n Gi  Mangrove Biosphere Reserve

**Description:** Students will travel to the C n Gi  Mangrove Biosphere Reserve (CGMBR) in the coastal district of Ho Chi Minh City where the Mekong Delta meets the South China Sea. Regarded as the lungs of the City, students will learn about site history (impacts of war, forestry, and shrimp export, followed by large-scale reforestation projects); current small- and large-scale stressors to the ecosystem; management objectives and challenges; and importance of the Reserve in responding to climate change. Local ecologists and planners will meet us on-site and provide their perspectives and experiences, supplementing background material that the students read beforehand.

**Objectives:**

1. Experience and observe a tropical mangrove forest and its associated estuaries, and gain exposure to ecologists working on conservation, climate change, and land use and management issues.
2. Observe the ecological relationships between a large biosphere reserve and a densely inhabited city nearby and how these dynamics may shift under climate change scenarios.
3. Explore potential solutions to global change being addressed at CGMBR, their perceived effectiveness, and which sectors (local community, government, academia, international support, NGOs) are most relevant to their implementation.

**Assignment:** Write a proposal to UNESCO (United Nations Educational, Scientific, and Cultural Organization) requesting a new cycle of funding for the CGMBR. Your proposal should include (1) descriptions of both present and projected conditions at the Reserve in the context of global climate change, (2) report on how prior funding has been allocated, and (3) a well-reasoned argument for why continued funding is necessary. Include cultural and socioeconomic details as appropriate. Do describe your experience as a guest of the CGMBR and why outreach efforts are relevant to the UNESCO and their mission.

You will be graded on proposal components (1)-(3), persuasiveness, and writing quality (when your draft is finished please have a classmate review your paper).

**Draft Due Date:** February 25 (B12). Drafts will be exchanged with peers for review.

**Final Due Date:** March 8 (B14). Include reviewed and signed draft with final.

### **Independent Field Assignments**

Throughout the voyage, students are to keep a journal of their observations in-country relevant to the topics in this Global Change Ecology Course. Include graphic documentation, whether sketches (don't worry about your drawing skills) and/or photographs. Electronic journals are acceptable but hard copy is preferred.

Questions to bear in mind:

- What did you do while in-country?
- Based on our discussions, “Global Change Realities in [Nation],” what evidence did you observe of the described issues within each country?
- What efforts, if any, did you see to address climate change stressors? Could you determine who was overseeing these efforts?

Working in groups of 3-4, after every third port of call (Hong Kong, Cochin, Tema) students will pool their observations and give short presentations comparing the last three ports with respect to the above questions. Commonalities and differences with respect to geography, ecosystems, development, evidence of global change, and management responses should be highlighted.

### Champion a Reversal Strategy

Throughout the voyage, a copy of Drawdown (Hawken, 2017) will be available for your perusal. At your convenience, choose a global warming strategy explored in the book and become familiar with it (put a sticky note on the page of the book with your name to indicate that that topic is taken). On Days [A21] and [A22] you will give a brief verbal description of the reversal strategy that resonates, and be prepared to discuss pros and cons with other students.

### METHODS OF EVALUATION

| Component of Grade   | Total Points   | Percentage of Grade |
|--|--|---------------------|
| Daily quizzes (23 @ 10 pts each)   | 230  | 42                  |
| Brief description of reversal strategy from <u>Drawdown</u> (1)  | 10   | 2                   |
| Field Day & Proposal <ul style="list-style-type: none"> <li>- Participation</li> <li>- Draft reviews</li> <li>- Final</li> </ul> | 110 <ul style="list-style-type: none"> <li>- Participation (55)</li> <li>- Draft proposal peer reviews (5)</li> <li>- Final proposal (50)</li> </ul> | 20                  |
| Cross-Port Observations and Presentation   | 100 <ul style="list-style-type: none"> <li>- Individual journal (25)</li> <li>- Group presentation (75)</li> </ul>                                   | 18                  |
| Final Exam (1)   | 100  | 18                  |
| <b>Total</b>   | <b>550</b>   | <b>100</b>          |

**Quizzes** are passed out at the beginning of class and all students will have 10 minutes to complete and hand in the quiz. Unfinished quizzes will be turned in at the end of 10 minutes (arrive on time). There will be no makeup quizzes.

## 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:

| <u>Excellent</u> | <u>Good</u> | <u>Satisfactory/Poor</u> | <u>Failing</u>   |
|------------------|-------------|--------------------------|------------------|
| 97-100%: A+      | 87-89%: B+  | 77-79%: C+               | Less than 60%: F |
| 93-96%: A        | 83-86%: B   | 70-76%: C                |                  |
| 90-92%: A-       | 80-82%: B-  | 60-69%: D                |                  |

## 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](mailto: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."

## **RESERVE BOOKS FOR THE LIBRARY**

AUTHOR: Hawken, Paul  
TITLE: Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming  
PUBLISHER: Penguin Books  
ISBN #: 9780143130444  
DATE/EDITION: 2017

AUTHOR: Kolbert, Elizabeth  
TITLE: The Sixth Extinction: An Unnatural History  
PUBLISHER: Henry Holt & Co.  
ISBN: 978-1-250-06218-5  
DATE/EDITION: 2014/1<sup>st</sup>

## **FILM REQUEST**

Title of Film: Beasts of the Southern Wild  
Distributor: Fox Searchlight

Title of Film: Chasing Coral  
Distributor: Netflix

Title of Film: Chasing Ice  
Distributor: Amazon

Title of Film: A Plastic Ocean  
Distributor: Netflix

Title of Film: Racing Extinction  
Distributor: Discovery Channel

## **ELECTRONIC COURSE MATERIALS**

AUTHOR: Dudgeon, D.  
ARTICLE/CHAPTER TITLE: Requiem for a river: extinctions, climate change, and the last of the Yangtze  
JOURNAL/BOOK TITLE: Aquatic Conservation: Marine and Freshwater Ecosystems  
VOLUME: 20  
DATE: 2010



PAGES: 127-31

AUTHOR: Gall, SC., and R.C. Thompson.

ARTICLE/CHAPTER TITLE: The impact of debris on marine life.

JOURNAL/BOOK TITLE: Marine Pollution Bulletin

VOLUME: 92

DATE: 2015

PAGES: 170-9

AUTHOR: Walther, G.-R., E. Post, P. Convey, A. Menzei, C. Parmesan, T.Beebee, J.-M.

Fromentin, O. Hoegh-Guldberg, and F. Bairlein

ARTICLE TITLE: Ecological responses to recent climate change

JOURNAL: Nature

VOLUME: 416

DATE: 2002

PAGES: 389-95

#### **ADDITIONAL RESOURCES**

None