

## **Syllabus for The Science of Harmful Algal Blooms**

**Course title:** Tiny But Toxic! Harmful Algal Blooms: science, technology, and you!

**Semester:** Spring 2011

**Credit:** One graduate credit for a minimum of 12 hours on line, personal interaction with presenters and instructor, and completion of requirements.

**Dates and times:** Monday March 21 – Friday April 8, 2011

This is an on-line course presented in asynchronous format, which means that participants may log on to the course web site at any time during the course. Course materials for educators, including background information, readings, lesson plans, and web site links, will be posted on line throughout the course. Each week additional materials related to that week's focal topic will be added to the on-line course web site. Scientists will respond to participants' questions and participate in discussions on the course web site during Monday through Friday each week of the course.

Participants earning credit must log at least 4 hours on the course web site during each week of the course, for a total of at least 12 hours. College of Exploration is able to track individuals' time logged in to the course web site to verify hours.

**Location:** This is an on-line course, so participants can join from any location where they are connected to the internet.

**Instructor:** Pat Harcourt

Centers for Ocean Sciences Education Excellence, COSEE-West  
Wrigley Institute for Environmental Sciences  
University of Southern California  
[pharcour@usc.edu](mailto:pharcour@usc.edu) 213 740-4693

**Course Description:** Although most phytoplankton are so tiny they can't be seen without a microscope, their role as producers at the foundation of marine food webs is vitally important in ocean ecosystems. However, some species of phytoplankton, also called microalgae, can cause problems for marine life and humans, with health impacts ranging from mild to severe or even lethal. In this course we will explore the mysterious world of saltwater and fresh water phytoplankton and learn about harmful algal species, what makes them so dangerous, and how marine mammals and seabirds that are sickened by harmful algae are treated. During the course, participants will have an opportunity to interact with marine biologists carrying out cutting edge research on harmful algae, marine technology experts who interpret satellite and instrument data to predict and track algae blooms, a marine mammal veterinarian and marine medical technicians who work to rehabilitate animals stricken with illness from harmful algae.

The course is designed especially for educators, with resources for both classroom teachers and informal educators. Each week of the three-week course will include a keynote presentation, resources for teaching about the topics, question and answer sessions, and discussions. Participants may visit the web site at any time during the course to view or download materials, submit questions, and participate in discussions. Participants earning credit for the course will be required to read or use specific materials, participate in on-line discussions, log at least 4 hours per week during the three weeks of the course, and submit one lesson plan by **Friday April 15, 2011**.

### **Learning Objectives**

1. Participants will be able to define and differentiate among plankton, protists, phytoplankton, diatoms, dinoflagellates, and marine bacteria.
2. Participants will be able to name and describe at least five species of harmful microalgae, including their distribution and how they affect marine life and/or humans.
3. Participants will be able to identify four instruments or technological methods used to study or track harmful algae blooms and describe how they are used.
4. Participants will be able to explain connections between environmental factors and harmful algae blooms that have been demonstrated through research.
5. Participants will be able to describe the signs of paralytic shellfish poisoning and amnesic shellfish poisoning in humans, and how these illnesses can be avoided.
6. Participants can name at least two species of marine mammals and two species of seabirds that can be affected by harmful algae blooms and explain how they can be rehabilitated at specialized sites.

### **Course Expectations**

Participants taking the course for credit will be expected to:

1. Log in to each room of the on-line course web site, and spend at least 4 hours logged in to the presentation or resource rooms during each week of the course.
2. Complete and post assignments including responses to weekly questions and curriculum assignments.
3. Post at least one question for the scientist and one discussion comment each week.
4. Develop one lesson plan based on material presented in the course (see lesson plan guidelines below). The lesson plan will be **due Friday April 15**.
5. Communicate with the instructor at least once per week during the course.

### **Course Outline**

**Week 1** Materials for week one will be posted Friday March 18

Interactive discussions with scientists Monday March 21 – Friday March 25

Keynote presentation: Dr. David Caron, Wrigley Institute for Environmental Studies at University of Southern California. "Harmful Algal Blooms along the Southern California Coast. What are They, What are Their Causes, What are Their Impacts?"

Dr. Caron will provide an introduction to harmful algae and the dangerous effects of harmful algal blooms on marine life and humans.

Interaction with scientists: Dr. Caron and the Ph.D. students in his lab will respond to questions from course participants during week 1 and 2.

Curriculum materials: Readings, lesson plans, and resources will include background on harmful algae and teaching ideas for introducing, identifying, and comparing harmful algae and understanding their ecological roles.

**Week 2** Materials will be posted Friday March 25

Interactive discussions with scientists Monday March 28 - Friday April 1

Keynote presentations: Beth Stauffer, Ph.D. candidate, Wrigley Institute for Environmental Studies at University of Southern California. "Studying Harmful Algal Blooms" Ms. Stauffer will describe her research on community interactions of fresh water and salt water HABs and the physical factors that promote blooms. Amanda Dillon of Southern California Coastal Ocean Observing System will introduce participants to the remote sensing data and instrumentation used to track and study HABs.

Interaction with scientists: Dr. Caron and the Ph.D. students in his lab will respond to questions from course participants during week 1 and 2.

Curriculum materials: Readings, lesson plans, and resources will focus on research questions and use of technology to study HABs.

**Week 3** Materials will be posted Friday April 1

Interactive discussions with veterinarian and staff Monday April 4 - Friday April 8

Virtual tour of Marine Mammal Care Center guided by staff veterinarian Dr. Lauren Palmer and Director of Operations David Bard, and virtual tour of International Bird Rescue Research Center guided by Rehabilitation Manager Julie Skoglund. The presenters will speak about the impacts of HABs on marine mammals and waterbirds.

Interactions with veterinarian and marine animal rehabilitation professionals: staff from Marine Mammal Care Center and International Bird Rescue Research Center will respond to questions during week 3.

Curriculum materials: Readings, lesson plans, and resources will include an overview of species of animals and birds which are vulnerable to illnesses caused by HABs; information on symptoms, treatment, and rehabilitation of the animals and birds; locations with facilities to care for the animals, comparison with impacts on humans, and information about volunteer and career opportunities in marine animal care.

## Course Materials

### Web sites for presenters:

Dr. Dave Caron lab <http://college.usc.edu/labs/caron//home/index.cfm>

Southern California Coastal Ocean Observing System <http://www.sccoos.org/>

International Bird Rescue Research Center [http://www.ibrrc.org/so\\_cal\\_center.html](http://www.ibrrc.org/so_cal_center.html)

Marine Mammal Care Center <http://www.marinemammalcare.org>

**Additional information:** this is a basic list; an annotated list of relevant web sites will be posted each week of the course.

CA Department of Public Health Phytoplankton Monitoring Program  
<http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/PhytoplanktonMonitoringProgram.aspx>

CDC Health Studies Branch Harmful Algal Blooms site  
<http://www.cdc.gov/hab/default.htm>

GEOHAB Global Ecology and Oceanography of Harmful Algal Blooms  
<http://www.geohab.info/>

NOAA Marine Biotoxins Program <http://www.chbr.noaa.gov/>

NOAA National Center for Coastal Ocean Science Phytoplankton Monitoring Network  
<http://www.chbr.noaa.gov/pmn/default.aspx>

Toxic and Harmful Algal Blooms - Educational Activities  
<http://www.bigelow.org/edhab/>

Washington State Shellfish Biotoxin site  
<http://ww4.doh.wa.gov/scripts/esrimap.dll?name=bioview&Cmd=Map&Step=1>

Woods Hole Oceanographic Institution Harmful Algae site  
<http://www.whoi.edu/redtide/>

### Readings:

Bigelow Lab for Ocean Sciences. 2009. "Building a Bloom"  
[http://www.bigelow.org/edhab/building\\_bloom.html](http://www.bigelow.org/edhab/building_bloom.html)

Bigelow Lab for Ocean Sciences. 2009. "Freshwater Blooms"  
<http://www.bigelow.org/hab/fre.html>

Bigelow Lab for Ocean Sciences and NASA. 2000. "From the top of the world to the bottom of the food web" <http://www.bigelow.org/foodweb/>

NOAA National Center for Coastal Ocean Science. 2006. "Harmful Algal Blooms" [http://www.cop.noaa.gov/stressors/extremeevents/hab/current/Hab\\_overview.pdf](http://www.cop.noaa.gov/stressors/extremeevents/hab/current/Hab_overview.pdf)

NOAA National Ocean Service. 2004. "Bad Algae" [http://oceanservice.noaa.gov/education/lessons/bad\\_algae.html](http://oceanservice.noaa.gov/education/lessons/bad_algae.html)

NOAA National Ocean Service. 2004. "Harmful Algae in the Great Lakes" <http://www.glerl.noaa.gov/res/Centers/HumanHealth/docs/habs.pdf>

NOAA National Environmental Satellite Data and Information Service. 2006. "Investigating the Ocean: Algae Blooms." <http://www.science-house.org/nesdis/algae/background.html>

Singh, E., and M.B. Neely 1999. Tiny Toxic Terrors: Harmful Algal Blooms. University of South Florida. [http://waves.marine.usf.edu/redtide\\_menu/redtide\\_menu\\_article.htm](http://waves.marine.usf.edu/redtide_menu/redtide_menu_article.htm)

Stewart, R. 2009. "Harmful Algal Blooms" Texas A&M University. <http://oceanworld.tamu.edu/resources/oceanography-book/harmfulagalblooms.htm>

### **Course requirements**

1. Participants will be required to develop one lesson plan based on material from the course. A complete description of the components of the lesson plan will be provided for participants during the course.
2. Participants will submit their lesson via email by **Friday April 15, 2011**.
3. Participants must post responses to all questions posted weekly in the credit section of the course web site.
4. Participants will be expected to read assigned materials and be prepared to discuss them on line.
5. Participants must submit at least one question and one comment for discussion each week.

### **Grading criteria**

1. The lesson plan will count for 70% of the grade
2. Class participation including posting questions and comments each week will count for 15% of the grade.
3. Responses to weekly credit questions will count for 15% of the grade.

Please contact Pat Harcourt at [pharcour@usc.edu](mailto:pharcour@usc.edu) or 508 215-9641 with questions or for more information.