Term Information

Effective Term	Autumn 2013

General Information

Course Bulletin Listing/Subject Area	Biology
Fiscal Unit/Academic Org	Introductory Biology - D0326
College/Academic Group	Arts and Sciences
Level/Career	Undergraduate
Course Number/Catalog	1109
Course Title	The Nature of Sustainability
Transcript Abbreviation	Sustainability
Course Description	Students will gain a better understanding of sustainability by using insights from biology, physics, chemistry, and economics to develop proposed policy statements with an emphasis on the history and nature of science. The case study-policy theme emphasizes interplay between science, technology and society.
Semester Credit Hours/Units	Fixed: 4

Offering Information

Length Of Course	14 Week, 7 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture, Recitation
Grade Roster Component	Recitation
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites

Exclusions

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	26.0101
Subsidy Level	General Studies Course
Intended Rank	Freshman, Sophomore, Junior, Senior

Quarters to Semesters

Quarters to Semesters	New course
Give a rationale statement explaining the purpose of the new course	Biology 1102 variant
Sought concurrence from the following Fiscal Units or College	

Requirement/Elective Designation

General Education course:

Biological Science

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

Content Topic List

- Nature of Science
- Disease
- Biodiversity
- Evolution
- Stem Cells & Cloning
- Cancer
- Nutrition
- Genetic Modification
- Climate Change
- Public Policy

Attachments

- Biology 1109 GE Assessment plan.docx: GEC Assessment

  (GEC Course Assessment Plan. Owner: Eakins,Barbara Ann)

- Biology 1109 syllabus 11_20_2012.docx: 1109 Syllabus

  (Syllabus. Owner: Eakins,Barbara Ann)

Comments

- Course Title: The Nature of Sustainability

  Transcript Abbreviation: Sustainability

  Course description: Exploration of contemporary issues in biology; topics may include evolution, disease, genetics, stem cells & cloning, nutrition, biodiversity, climate change, and biotechnology.

  Content topic list: REMOVE sex & gender and addiction, ADD nature of science, public policy, biodiversity, genetically modified organisms *(by Misicka,Matthew Alan on 11/21/2012 02:36 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Eakins,Barbara Ann	11/21/2012 02:05 PM	Submitted for Approval
Revision Requested	Misicka,Matthew Alan	11/21/2012 02:36 PM	Unit Approval
Submitted	Eakins,Barbara Ann	11/21/2012 02:50 PM	Submitted for Approval
Approved	Misicka,Matthew Alan	11/21/2012 02:53 PM	Unit Approval
Approved	Hadad,Christopher Martin	11/23/2012 01:31 PM	College Approval
Pending Approval	Nolen,Dawn Jenkins,Mary Ellen Bigler Vankeerbergen,Bernadette Chantal Hogle,Danielle Nicole Hanlin,Deborah Kay	11/23/2012 01:31 PM	ASCCAO Approval

Biology 1109 – What is the Nature of Sustainability? – Spring 2013

Dr. Steve Rissing, Professor; rissing.2@osu.edu (best contact method); 688-4989
Adam Andrews, Course Coordinator, …
Jonathan Horn, Assistant Course Coordinator, …
TBD, Head Graduate Teaching Associate, …

Lecture: M, W, F (3 x 55 min); Recitation 1 x 110 min
Text Required: *The New York Times* (subscription recommended)
Optional: Any recent college-level, introductory biology textbook (or web access)
Prerequisites: While no prerequisites exist, I recognize that all recent high school graduates have completed three years of science, usually including biology and have passed some form of state high school graduation examination. This course builds on that foundation (and that of BIO 1101 or its equivalent, if you have taken it) and does not repeat it.
Course Objectives: I have designed this course to meet the needs and interests of college students who have majors outside biology. The course presents the science of biology and related fields that bear on sustainability issues. I employ processes of discovery and inquiry to develop student-authored public policy positions on aspects of sustainability.

Consistent with this view of science as a process of discovery and application, BIO 1109 emphasizes student discovery of basic biological and related information, facilitated by lecture, and then applied in group and individual development of policy suggestions on each topic raised (see lecture schedule below.) I will use a "case study" approach, examining a few topics in sufficient detail to permit development of policy recommendations for each topic. This approach is also consistent with OSU's General Education (GE) guidelines; most students enroll in BIO 1109 to meet these guidelines.

General Education Natural Science Goals & Objectives

We have developed this course and its approach to fulfill the following GE Natural Science goals and objectives (from: http://asccas.osu.edu/curriculum/ge-goals-and-learning-outcomes):

Goals/Rationale: Students understand the principles, theories, and methods of modern science, the relationship between science and technology, the implications of scientific discoveries and the potential of science and technology to address problems of the contemporary world.

Learning Objectives:

1. Students understand the basic facts, principles, theories and methods of modern science.
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
3. Students describe the inter-dependence of scientific and technological developments.
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

I hope my students will gain a better understanding of sustainability by using insights from biology, physics and chemistry, and economics to develop proposed policy statements. I will emphasize the history and nature of science. The case study-policy theme emphasizes interplay between science, technology and society. This is the last science course many of you will take before joining the elite rank of college-educated citizens; the staff and I have designed this course with that opportunity and responsibility in mind.

Rather than concentrating briefly on a large number of topics, we will focus on four major areas of science that raise particularly perplexing public policy issues as follows:

COURSE THEMES

1. *Science & Public Policy I (introduction):* What biological insights does a scientifically literate American need to know?
2. *Breast Cancer:* Can we apply BIO101's "Genotype + Environment = Phenotype" insight to understand, predict and prevent breast cancer? How?
3. *Stem Cell Research:* Stem Cell research may save your life; why not do it?
4. *Genetically Modified Organisms:* Can GM Foods feed the world? Are there risks?
5. *Biodiversity:* It's more than polar bears and koalas, and it's the link between GMOs and medicine. So, why are we throwing it all away?
6. *Global Climate Change:* How do we impact the environment? What are our responsibilities and opportunities?
7. *Science & Public Policy II (coda):* What role does/should science play in setting public policy?

ASSIGNMENTS

Assignments focus on development of public policy on topics related to the nature of sustainability. Specifically, I have employed exercises to permit students to translate insights into current policy issues based a level of scientific understanding of any college graduate today. In this information age, students can access specific, technical details of a policy issue easily. We ask how to use that access to form reasonable, effective policy alternatives within the larger processes of a modern democracy. I intend the course and its exercises for soon-to-be college graduates who recognize the opportunities and responsibilities in this process.

I employ the device of college students who spend an academic term working on the staff of a member of Congress who prepare reports on current issues and the policy options available. In real-life, interns use information available from data repositories (including The Library of Congress) and from expert testimony in hearings to prepare policy statements and positions. Course lectures and guest presentations serve this function in our class. Each policy statement for each issue addressed includes the following:

- Problem Statement (1 page maximum; group) 40 points
- Option Statement (2 page maximum; individual) 50
- Preferred Policy & Contrary Statement (2 pages; group) 60

150/policy

In addition to the above, a brief lecture exercise (done cooperatively, or in some cases, individually) will generate 5 points per class meeting. Weekly New York Times exercises generate 10 points each, and recitation exercises generate 20 points each. The final grade is based on the following distribution of points earned by participating students:

Five policy statements at 150 points each	750 points
Forty lectures activities at 5 points each	200
Fourteen New York Times assignments at 10 points each	140
Eight recitation activities at 20 points each	160
SALG & other surveys	25
	~1275

The final grade depends on the percentage of total points you earn divided by the number of points possible (~1250). The grade scale is the standard one for OSU (92.9<A<100; 90<A-<93; 87<B+<90; etc.); while I do not round scores for individual assignments, I carefully evaluate all scores and grades based upon them at the end of the term. I will never curve components or grades down; I reserve the option to curve them up.

COURSE TOOLS

1. **Carmen** (http://carmen.osu.edu); Check Carmen regularly for relevant news items, course schedule changes, assignment guidelines, copies of images used in lecture, supplemental readings, etc.

2. **Collaborative Learning**: Working in heterogeneous teams provides a more effective learning experience; I will employ this approach.

3. **Center for the Study and Teaching of Writing** (http://cstw.osu.edu); The Writing Center at CSTW offers free help with writing at any stage of the writing process. It also maintains a resources page with writing handouts and web links.

EXPECTATIONS AND ASSURANCES

Students with Disabilities: I have tried to use insights of Universal Design for Learning in this course; the course staff and I routinely accommodate a number of students with varied disabilities. Should any student need any accommodation, please contact the Course Coordinator, Mr. Adam Andrews or Dr. Rissing.

Sustainability: We will consider “ecological footprints” during the study of global climate change and related issues. I am trying to reduce the footprint of BIO 102 and encourage you to do the same. Lecture images and other course materials are provided digitally; I encourage you to store and use them in that form. Please share with course staff and me ideas on how we might further decrease the ecological impact of the course.

Absences: Many written assignments are completed in lecture/recitation as part of a discussion. You can only earn points if you are present. Having someone else place your name on an assignment when you not there violates the OSU Code of Student

Conduct (see below.) If you must miss a class session (for a university sanctioned event) or miss because of illness, be prepared to provide documentation.

Academic Misconduct: OSU has a strict code of academic misconduct that requires us to report any and all cases of suspected misconduct (e.g. plagiarism in written assignments, *etc.*) to the OSU Committee on Academic Misconduct for adjudication. We have to adhere to this policy. You should understand the nature and consequences of plagiarism (and of anti-plagiarism sites like www.turnitin.com).

Section Changes: Make recitation section changes at the Center for Life Sciences Education office from 8:00-4:00 in Jennings 260. The staff there has up-to-the-minute information on space availability in the recitation section you may want to add.

Late Assignment Policy: 10% will be deducted from the graded assignment for each day past the due date that an assignment is late. After five (5) working days, no late assignments will be accepted. Exceptions may be made once with appropriate documentation (note from health care practitioner, employer, *etc*.).

A Word About Large Classes

This is a large class, but you are not a small part of it! To make our time together as valuable as possible, we all have to work hard at it. The following basic principles provide some guidelines:

Every student has the right to learn and the *responsibility* to not deprive others of that right
Every student is accountable for his or her own actions.

In order to get the most out of this class, please consider the following:
1. Attend all scheduled classes and arrive on time. Late arrivals and early departures disrupt class. If you must be late or leave lecture early, minimize the disturbance.
2. Do not read a newspaper or use your laptop during class; this distracts others around you.
3. Do not text-message during class; this also distracts people around you.
4. If you have trouble hearing in lecture because of distractions around you, quietly ask those responsible for the distraction to stop. If the distraction continues, please let us know.
5. Please remember to turn off your cell phone *before* it rings in class.

Adapted from: Brinko, K.T. and Menges, R.J., (Eds.) (1997). Practically Speaking: A Sourcebook for Instructional Consultants in Higher Education. Stillwater, OK: New Forums Press Inc.

BIO 1109; What is the Nature of Sustainability?

Week	Date	Lecture Questions	Recitation Activity
1	1/7	What to expect from this course; what is expected of me? What is scientific literacy?	Introductions; Writing sample; Grade norming exercise
	1/9		
	1/11	What is cancer and its frequency?	
2	1/14	What causes cancer?	Unintended effects of some compounds; Breast Cancer PS; NYT #1 & 2
	1/16	Why is breast cancer frequency increasing?	
	1/18	What does mitosis have to do with cancer?	
3	1/21	Martin Luther King Day	Breast Cancer OS Ethical Genetics NYT # 3
	1/23	What environmental factors influence cancer?	
	1/25	How do economists view cancer?	
4	1/28	What controls exist on cancer-causing substances	Breast Cancer PPS NYT# 4
	1/30	Why can't we find a 'cure for cancer'?	
	2/1	What have we learned from 4000 yrs of GMOs?	
5	2/4	What was the "Green Revolution"?	GMO PS Chapt Summ & disc #1 NYT # 5
	2/6	Who embraces new technologies first?	
	2/8	How can we genetically manipulate organisms?	
6	2/11	How do GMOs differ from past hi-tech organisms?	GMO OS NYT # 6
	2/13	How do economists view GMOs?	
	2/15	Can we meet the worldwide demand for food?	
7	2/18	What is cloning?	GMO PPS Stem Cells PS NYT # 7
	2/20	Who funds cloning research? Why?	
	2/22	Why not just transplant organs?	
8	2/25	What are ethicists' concerns about cloning?	Stem Cells OS NYT # 8
	2/27	How would Darwin view cloning?	
	3/1	What does the future hold for cloning, etc.?	
9	3/4	Dr. Douglas Kniss, Guest lecture	Stem Cells PPS NYT # 9
	3/6	How many species are there?	
	3/8	How do new species form?	
10	3/18	Why preserve biodiversity?	Biodiversity OS Chapt Summary #2 NYT # 10
	3/20	Why not preserve biodiversity?	
	3/22	Which biodiversity should we preserve?	
11	3/25	Isn't extinction natural?	Biodiversity PPS GCC PS NYT # 11
	3/27	Can we clone biodiversity?	
	3/29	What is the carbon cycle (Biology)?	
12	4/1	What/why is the carbon cycle (Physics)?	GCC OS; Ecological footprint; Sustainability Tour; NYT # 12
	4/3	Isn't CO_2 green?	
	4/5	Are things really that different?	
13	4/8	How much of this is a conspiracy to get grant money?	GCC PPS NYT # 13 (Stnblty tour, rain date)
	4/10	How do economists view Global Climate Change?	
	4/12	Will things be *that* bad?	
14	4/15	What is the role of science in a democracy?	Chapt Summary #3 NYT # 14
	4/17	What can other perspectives offer? (PANEL)	
	4/19	What is scientific literacy?	
15	4/22	What is the role of science in public policy?	No discussion sect
TBD		Final Exam (Project) due	

Biology 1109 GE rationale

Over the last decade, many have recognized the need for college graduates to become more "scientifically literate," and to have a better understanding of the area of "sustainability." At the same time, curriculum development perspectives emphasized development of formal reasoning, critical inquiry, and facility with basic scientific processes relevant to societal concerns. These goals fall within the realm of the OSU General Education Learning Goals, as evidenced by the OSU President's Council on Sustainability call in March 2009 for a GE course on sustainability ("support and encourage curriculum on sustainability and the development of a GEC class" [President's Council on Sustainability Annual Report to University Senate, 12 March 2009, target implementation date March 2010]). The course proposed here, the first, dedicated GE course option explicitly addressing sustainability as well as the pedagogical goals discussed above, comes in response to that call almost four years ago.

The course aligns well with GE Natural Science learning objectives; specific examples follow:

1. Students understand the basic facts, principles, theories and methods of modern science.
    a. Demonstrate Laws of Thermodynamics with energy conversions, biological and physical.
    b. Experiments conducted in the 1970's to reveal presence of cell signaling molecules (as basis for breast cancer and environmental estrogens)
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.
    a. van Helmont's discovery of how plants gain mass (CO_2)
    b. Lyell's (and others) discovery of geological time (and its significance with respect to fossil fuels)
    c. History of Agriculture and subsequent interactions with discoveries by Mendel and then Watson and Crick
3. Students describe the inter-dependence of scientific and technological developments
    a. Discovery of the "Ozone Hole" with satellite imagery
    b. Role of particle physics in discovery of DNA replication
    c. Development of climate models with use of super-computers
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.
    a. GMOs to feed the world; world population growth
    b. CO_2 accumulation through industrial burning of fossil fuels
    c. The Laws of Thermodynamics: "There's no such thing as a free lunch."

Biology 1109 Assessment plan

GEC Learning Objective	Indirect Methods	Direct Methods
1. Students understand the basic facts, principles, theories and methods of modern science.	SALG	Grading rubric for the policy statements will include a subscore addressing this learning outcome
2. Students learn key events in the history of science and recognize that science is an evolving body of knowledge.	SALG	Grading rubric for the policy statements will include a subscore addressing this learning outcome
3. Students provide examples of the inter-dependence of scientific and technological developments.	SALG	Grading rubric for the policy statements will include a subscore addressing this learning outcome
4. Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.	SALG	Rubric used in grading policy statements and New York Times assignments will have separate subscores addressing this learning objective

We will use specific subscores on the rubrics used to grade policy statements to evaluate GE learning objectives 1-3. For example, students must use basic facts, principles, theories and methods of modern science (LO #1) in their Option Statement. Learning objective 4 will be assessed by evaluating each student's ability to discuss social and philosophical implications and uses of scientific discoveries in their policy statements as well as the New York Times assignments for this course.

In addition, we will use the Student Assessment of Learning Gains (SALG), an instrument that has been extensively used in other Biology courses at Ohio State (including Biology 1102) to evaluate students' perceptions of the course as well as their self-assessment of whether they have met the GE learning objectives for this course. The SALG is described at the following website: http://www.wcer.wisc.edu/salgains/ftp/SALGPaperPresentationAtACS.pdf

Examples of SALG questions asked in a previous Biology 102 class:

> As a result of your work in this class, what GAINS DID YOU MAKE in your UNDERSTANDING of each of the following? (1 = no gains, 2 = a little gain, 3 = moderate gain, 4 = good gain, 5 = great gain)
>
> - How ideas from this class relate to those encountered in other disciplines
> - How this class helps people address real world issues
> - Articles in the media that discuss scientific findings
> - How to think about a research question
> - Historical aspects of biology
> - Understanding the main concepts (basic facts, principles, theories and methods of modern biology)
> - Understanding the interdependence between scientific and technological developments
> - Understanding the potential of science and technology to address problems of the contemporary world
> - Current and future significance of biology on society
> - Scientific ethics and practices
>
> Please comment on how this class has CHANGED YOUR ATTITUDES toward this subject.
>
> What will you CARRY WITH YOU into other classes or other aspects of your life?

The indirect and direct measures of the GEC learning outcomes will be compiled by the instructor and Center for Life Sciences Education staff and reviewed with the course instructor, the course coordinator, and other CLSE staff. The expected level of achievement is:

- at least 75% of the students will perform satisfactorily (C work or better) on the policy statement subscores reflecting learning objectives 1-3
- 75% of the students will perform satisfactorily (C work or better) on the policy statement subscores and the New York Times assignment subscores having to do with learning objective 4
- a class average of 3.0 or higher on the SALG questions in which students self-evaluate how their understanding of the GE objectives has increased during the course

These scores would indicate that most students perceived at least “moderately” increased understanding of the objectives of the GEC and could demonstrate their learning in writing. Other questions on the SALG address additional course learning outcomes, course mechanics, *etc.*, and will be considered in making modifications to the course, if necessary. If the course assessments indicate that students do not meet the expected level of achievement of GEC learning outcomes, the instructor will modify the course in ways that will more fully address these learning outcomes.