

## Term Information

Effective Term Spring 2014

## General Information

Course Bulletin Listing/Subject Area Entomology  
Fiscal Unit/Academic Org Entomology - D1130  
College/Academic Group Food, Agric & Environ Science  
Level/Career Undergraduate  
Course Number/Catalog 2101  
Course Title Insects and Human Affairs: Pests, Plagues, Poisons and Politics  
Transcript Abbreviation PestsPlagues  
Course Description Insects are a daily fact of life, exerting major influence on human affairs over the course of history. The course analyses the extensive and sometimes uncomfortable relationships between insects and humans, including historical roots of insect/human interactions, impact of insects on development of scientific thought, use of insects as experimental models in drug design and military applications.  
Semester Credit Hours/Units Fixed: 3

## Offering Information

Length Of Course 14 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 Lecture  
Credit Available by Exam No  
Admission Condition Course No  
Off Campus Never  
Campus of Offering Columbus

## Prerequisites and Exclusions

Prerequisites/Corequisites  
Exclusions Not open to students with credit for 102

## Cross-Listings

Cross-Listings

## Subject/CIP Code

Subject/CIP Code 26.0702  
Subsidy Level General Studies Course  
Intended Rank Freshman, Sophomore, Junior, Senior

## **Quarters to Semesters**

### **Quarters to Semesters**

Modified or re-envisioned course that includes substantial parts of the content and learning goals of one or more quarter courses

**List the current courses by number and title that are to be subsumed into proposed course**

Entomology 102, Insect Biology-II

## **Requirement/Elective Designation**

General Education course:

Biological Science

## **Course Details**

### **Course goals or learning objectives/outcomes**

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

**Content Topic List**

- Insects in divine texts, myths and fables---the use of insects to explain biological phenomena is explored using the species-scape concept.
- Sound production in insects--students learn about the anatomy and morphology of sound producing organs in insects. The use of insects as inspiration for human music is discussed.
- Biology of Insect-vectored disease--students learn about the anatomy, physiology and morphology of insect-borne disease transmission.
- Fear of insects---the evolutionary roots of fear of insects is explored as well as specific psychological conditions, e.g., delusional psychosis and insects in dreams.
- The Black Death--students study the complex interplay between fleas, rats and the plague bacterium that resulted in one of the most devastating pandemics in human history. The effects on society, medicine and religion are recounted.
- Insects at war--the importance of insect-borne disease in determining the outcome of armed conflict is studied using Napoleonic campaigns in Egypt, Haiti and Russia as examples.
- The Rise of the Pesticide Industry following successful deployment of DDT in WWII is studied. Technological impediments to synthesizing insecticides on a massive scale are studied. The ecological impacts of insecticides are covered.
- Insects as biological weapons of war is covered from biblical times to the advent of the federal agency known as DARPA. Effectiveness of insect-based biological weapons and technological constraints are detailed.
- The potential for using insect secondary chemicals for a variety of purposes ranging from warfare to therapeutic drugs is explored. Technological impediments are highlighted.
- Role of insects in feeding humans around the globe is considered as well as technological and psychological impediments to using of insects as a human food source, especially in western cultures.
- Comparison of insect and human nutrition---anatomy and morphology of insect and human digestive system is studied with emphasis on energy and metabolic requirements of each organism.
- Insects in medicine--the use of insects in medicine is detailed from Pliny's Doctrine of Signature to the use of maggots to debride wounds in modern hospitals.
- Bugs as drugs---the potential for insect-based products to serve as therapeutics for human disease is explored.
- How insects changed science--the role of insects in elucidating the germ theory of disease is discussed as well as how the nature of science was changed by this discovery.
- Insects and the modern synthesis--T.H.Morgan's work on mutation in *Drosophila* and its importance to the establishment of the modern synthesis is covered.
- Pollination services---The economic value of insects is largely unsung and unnoticed. But, the contributions of pollinators is significant. Students learn how pollination works and about the ecological and pathological threats to pollinators.
- Silk production is another way in which insects/arthropods benefit the economy. The biology and chemistry of silk production is covered as well as a taxonomic look at which organisms make it.

**Attachments**

- Entomology 2101.doc  
*(Syllabus. Owner: Fisher, Susan Warwick)*
- FinalsyllabusEntomology 2101GEC Natural Science.doc  
*(Syllabus. Owner: Welty, Celeste)*
- Entomology2101FINALGEAssessmentPlanRevised.doc  
*(GEC Course Assessment Plan. Owner: Welty, Celeste)*
- Entomology2101GERationale.docx  
*(GEC Model Curriculum Compliance Stmt. Owner: Welty, Celeste)*

**Comments**

- See 1-22 e-mail. *(by Vankeerbergen, Bernadette Chantal on 01/22/2013 10:23 AM)*
- Use replacement syllabus to evaluate this course. *(by Welty, Celeste on 11/07/2012 02:16 PM)*
- I believe you wanted this course sent back. If not push it forward again. *(by Pfister, Jill Ann on 11/05/2012 08:55 AM)*

**Workflow Information**

Status	User(s)	Date/Time	Step
Submitted	Fisher, Susan Warwick	06/15/2012 09:39 AM	Submitted for Approval
Approved	Pfister, Jill Ann	07/26/2012 08:03 AM	Unit Approval
Revision Requested	Pfister, Jill Ann	11/05/2012 08:55 AM	College Approval
Submitted	Welty, Celeste	11/07/2012 02:19 PM	Submitted for Approval
Approved	Pfister, Jill Ann	11/19/2012 09:46 AM	Unit Approval
Approved	Pfister, Jill Ann	11/19/2012 09:55 AM	College Approval
Revision Requested	Vankeerbergen, Bernadette Chantal	11/26/2012 03:22 PM	ASCCAO Approval
Submitted	Welty, Celeste	01/04/2013 03:00 PM	Submitted for Approval
Approved	Pfister, Jill Ann	01/07/2013 06:10 PM	Unit Approval
Approved	Pfister, Jill Ann	01/07/2013 06:11 PM	College Approval
Revision Requested	Vankeerbergen, Bernadette Chantal	01/22/2013 10:23 AM	ASCCAO Approval
Submitted	Welty, Celeste	01/30/2013 03:03 PM	Submitted for Approval
Revision Requested	Pfister, Jill Ann	02/26/2013 09:50 AM	Unit Approval
Submitted	Welty, Celeste	02/27/2013 10:05 AM	Submitted for Approval
Approved	McSpadden Gardener, Brian B.	02/27/2013 11:13 AM	Unit Approval
Approved	Pfister, Jill Ann	02/28/2013 07:21 AM	College Approval
Pending Approval	Nolen, Dawn Jenkins, Mary Ellen Bigler Vankeerbergen, Bernadette Chantal Hogle, Danielle Nicole Hanlin, Deborah Kay	02/28/2013 07:21 AM	ASCCAO Approval

**Entomology 2101**  
**Insects and Human Affairs: Pests, Plagues, Poisons & Politics**  
**Spring 2013**  
**Dr. Susan Fisher, Instructor**  
**236 Kottman Hall**  
**[fisher.14@osu.edu](mailto:fisher.14@osu.edu)**  
**292-1617**  
**3 Credit Hours**

**Course Format:** 2 one hour lectures/week  
1 two hour recitation/week

**Fulfills the General Education Natural Science Requirement for the BA**

**Course Description:** Insects have invaded every environment imaginable from the binding of books to human skin. Thus, insects are a daily fact of life and have exerted considerable influence on human affairs over the course of history. This course analyses the extensive and sometimes uncomfortable relationship between insects and humans, including historical roots of insect/human interactions both positive and negative, impact of insects on development of scientific thought and use of insects as experimental models in drug design and military applications.

**Goals and Expected Learning Outcomes for GE Natural Science-Biological Science:**

**Goals:** 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.

**Expected Learning Outcomes:**

**Learning Outcome 1:** Students understand the basic facts, principles, theories and methods of modern science

**Learning Outcome 2:** Students understand key events in the development of science and recognize that science is an evolving body of knowledge.

**Learning Outcome 3:** Students describe the inter-dependence of scientific and technological developments.

**Learning Objective 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.

# Course Format

## I. Lectures

Lecture Number	Lecture Topic
1	Introduction and Administrivia
2	How Humans Understand the World: Insects as Myth
3	Faith and Biology: Insects and the Abrahamic Faiths
4	Sound Production by Insects
5	How and Why insects make music
6	How insects taste the world: chemoreception and how humans can use it
7	Fear of Insects—Evolutionary roots and Biological Basis
8	Insects in Dreams—Neurobiology and Psychological Significance
9	Serial Killers—Biology of Insect Borne Diseases
10	Hour Exam I
11	Flee Wikkyd Heires and Loose Women: A Primer on the Biology of the Black Death
12	Was Napoleon Defeated by Insects? Three Case Studies: I. Napoleon, Plague and Egypt
13	II. Yellow Fever, Napoleon & Haiti
14	III. Typhus, Napoleon and the Russian Winter
15	DDT: Miraculous Powder or Elixir of Death?
16	The Rise and Influence of the Pesticide Industry
17	Modern Warfare: Insects as Biological Weapons of War
18	Insect Defense Compounds and Their Manipulation by Humans

19	Hour Exam II
20	Insect Cuisine—You eat what????? Role of Insects in Feeding Humans around the Globe
21	The Basic Biology of Nutrition—Energy Cycles
22	A comparison of insect and human nutrition
23	Insects in Medicine—Ancient to Modern Practices
24	Of Venoms, Poisons and Insect-Based Cures: Bugs as Drugs
25	How Insects Changed Science—Pasteur and the Germ Theory of Disease
26	T.H. Morgan and the role of insects in creating the Modern Synthesis
27	Silk, its historical significance and biochemistry
28	Pollination Services: Ecological & Economic Benefits

### **Text**

**At present, there is no published text book that offers adequate coverage of the diverse topics found in this course. However, I am in the process of writing one and a draft will be available by Spring 2014. I am also supplementing the course with an extensive reading list for the recitation section which is detailed below. Students will also asked to invest in a package of 3x5 index card which they should bring to each class. We ask the students to write down any questions they have about the material covered in lecture. Please list concepts that were unclear or topics over which you'd like additional coverage. Please give these cards to the TA after each class so that he/she can address points of uncertainty in recitation.**

## Course Evaluation and Assessment

Your grade in this course will be determined from the following:

### Assessment of Lecture Content:

1. **Hour Exam 1**—100 points
2. **Hour Exam 2**—100 points
3. **Comprehensive Final**—200 points

### Assessment of Recitation Content:

1. **Recitation Participation**—50 points. Students will be awarded up to 5 points each week for participation in recitation discussions. In addition to contributing to the general discussion, students will be graded **generally** on their ability to articulate the benefits and problems associated with insects on society and **specifically** on their understanding materials covered under the four learning outcomes..
2. **Semester Long Recitation Project**—170 points (see breakdown below)
3. **11 In-class Recitation Exercises**—170 points  
These will be filled out and handed in at the beginning of the next recitation period. Please note that 4 of the exercises are worth 25 points each while the rest are worth 10 points.
4. **Insects in the News:** You may earn 2 points of extra credit (up to 20 points per student) for each insect-related article or story you bring to me prior to the 11<sup>th</sup> week of class. We will use the articles in recitation to explore how effectively the scientific method is reflected in the popular press and how insects influence our understanding of contemporary society.

**Total Possible Points in Course: 780**

### **Grading Scale:**

93-100	A
90-92	A-
87-89	B+
84-86	B
80-83	B
77-79	C+
74-76	C
70-73	C-
67-69	D+
64-66	D



## Recitation Schedule

We're calling this section a recitation and you will be graded on your participation as outlined on the rubric posted on Carmen. However, you will also be doing an activity every week. These activities vary from watching videos to using dry labs to perform simulations to engaging in purely creative activities like writing a myth. You will be handing something in for each of the first 11 weeks. In each case, the written materials you will be handing in are due at the beginning of the subsequent recitation. The point value of these assignments is generally 10 points but there are four recitation exercises that are worth 25 points each as indicated below. During the last 3 weeks of class, we will be listening to and critiquing student papers and projects with the goal of expanding your understanding of how insects influence the world. We will also use the recitation section to make sure that you have a thorough understanding of the scientific method and the four learning outcomes for this course.

- Week 1---Getting organized. Students will be broken into working groups, view the video "Know the Difference: Hypothesis vs. Theory", discuss evidence-based ways of knowing and categorize statements of different types (**Exercise 1**).
- Week 2—Create an insect myth to explain some biological principle. Students will examine live and pinned insects, look up sources on line that discuss the ecology and feeding habits of an insect of their choosing and write an original myth to explain some aspect of the insect's habits (**Exercise 2, 25 points, use the rubric on Carmen**).
- Week 3—Fear of insects, a cinematic experience—students will choose and watch an insect-themed movie. Then, they will evaluate the accuracy of how insects are depicted in horror films and examine the reasons that people fear insects (**Exercise 3**). (**Topics for semester long project must be approved by TA by week 4; consult rubric on Carmen**).
- Week 4—Insect Sound Production and Music. Students will compare the anatomy and physiology of sound production in insects and humans and explore how and why insect motifs are used in human music (**Exercise 4 Insect-Based Music in Society, rubric posted on Carmen, 25 Points**).
- Week 5—Silent Spring—the movie and the book. Understanding environmental toxicology and social impact of insecticides. Dry lab: Altering the speed with which resistance to insecticides occurs (**Exercise 5**).
- Week 6 What can you eat---according to the Bible and is there a biological basis? (**Exercise 6, 25 points, rubric on Carmen**)
- Week 7 Insects and nutrition—a comparative study. Students will gather information about the dietary habits of entomophagous cultures in the contemporary world, calculate the adequacy of these diets to meet the FDA's requirements for an adequate diet and compare the results to their own eating habits which each student will be asked to track for a week. (**Exercise 7, 25 points, rubric on Carmen**)
- Week 8 Insects and human disease—methods for tracking the spread of pandemic

Diseases. Students will perform a simulation of the spread of an insect-vectored pandemic disease (**Exercise 8**)

Week 9 Insects in medicine. Students will examine several unique biochemical processes in insects and perform an exercise to evaluate the possibilities of using such processing in human medicine(**Exercise 9**)

Week 10 *Drosophila melanogaster* and the genetics of mutation dry lab (**Exercise 10**)

Week 11 Pollination Ecology—What would happen in a world without pollinators? (**Exercise 11**)

Week 12—student presentations

Week 13—student presentations

Week 14—review for final

### **Semester long student project**

Each student will be asked to choose an insect-based project of interest to him or her. Over the course of the semester, each student will perform research on the chosen topic, write a paper on the topic and create a physical manifestation of the topic. At the end of the semester, each student will give presentation in which the findings of the research paper are detailed and the creative part of the project is presented. For instance, a student might choose to study the spiders that are poisonous. After doing research, the student will write a 10-15 page paper (with proper documentation) on the topic in which he/she might explore the biology of poisonous spiders, possible historical implications of famous spider bites, and the impact of poisonous spiders on art and society, e.g. the Tarantella. The student will then create a painting, song, sculpture, weaving, video, dance, short-story, poem etc. on the subject. Through these diverse activities, the student will come to appreciate the consilient relationship between science, art and human expression.

Students will be asked to identify their topic of choice by week 4 on the semester calendar. Research on the subject should begin immediately thereafter. The TA will check for progress every week in recitation. The recitation periods in weeks 12 and 13 will be devoted to student presentations. **The whole project must be completed by the time of recitation during week 11.** Presentations by individual students should be 10-15 minutes in length.

### **Semester-Long Projects will be graded as follows:**

Research paper: 100 points

Creative project: 50 points

Presentation: 20 points

Rubrics for grading the paper and the creative project will be handed out in class.

**Absences:** Students are expected to attend both lectures and recitation during each period it is offered. Attendance in lecture will not be taken. However, attendance in recitation will be taken by the TA and will be used, in part to determine your participation grade. The TA will record participation (assessed as none (0), moderate (1) or high (2)). The total points will be tallied for the quarter and used to determine your participation score. If you are too ill to take an exam, please contact your TA or Dr. Fisher within 24 hours of the class period in which the exam was taken. You must be seen by and receive written documentation from a professional health care practitioner on the day of the exam in order for a make up to be given. Other serious personal problems will be considered, in advance, on an individual basis. In all instances, documentation supporting the excused absence will be required.

**Academic Misconduct:** OSU has a strict code of academic that requires us to report any and all cases of suspected misconduct (e.g. cheating on an examination, plagiarism in written assignments, using an examination proxy, failure to follow course policies etc.) to the OSU Committee on Academic Misconduct for adjudication. “It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term ‘academic misconduct’ includes all forms of students academic misconduct wherever committed: illustrated by, but not limited to, cases of plagiarism and dishonest practices in connections with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct ([http://studentaffairs.osu.edu/info\\_for\\_students/csc.asp](http://studentaffairs.osu.edu/info_for_students/csc.asp)).”

**Accommodation of Special Needs:** Students with disabilities that have been certified by the Office of Disability Services will be appropriately accommodated, and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Ave; telephone: 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.

**Sexual Harassment:** OSU considers sexual harassment offenses to be unacceptable behaviors that erodes the quality of the learning environment. Please report any concerns about questionable behavior to Dr. Fisher.

## **Reading List for Course**

### **Week 1**

Excerpts from: Kritsky, G. and R. Cherry (2000). *Insect Mythology*. Writers Club Press, Lincoln, NE, 137 pp.

Amar, Z. ((2002). The Eating of Locusts in Jewish Tradition after the Talmudic Period. *The Torah u-Madda Journal*. 11: 186-202.

### **Week 2**

Berenbaum, M. (1996). “Let me tell you ‘bout the birds and the bees. “ *Amer. Entomology* 42: 134-135.

Hogue, C.L. Cultural Entomology. *Ann Rev. Entomol.* 32: 181-199.

### **Week 3**

Fleischman, P. (1988). *Joyful Noise—Poems for Two Voices*. Harper & Row, Pub.

Dethier, V.G. (1993). *Crickets and Katydid, Concerts and Solos*. Harvard Univ. Press, Cambridge, MA.

Klein, B.A. (2012). The Curious Connection between Insects and Dreams. *Insects* 3: 1-17.

### **Week 4**

Excerpts from Strassler, R.B (ed.) (1998). **The Landmark Thucydides: A Comprehensive Guide to the Peloponnesian War**. Sections 2.47-2.59 on the Plague, pp. 118-123.

Excerpts from Campbell, D. (1921). Translation by M. Rigg of The Decameron, Bocaccio, G. , Vol. 1, pp 5-11.

The Decameron from Wikipedia, [http://en.wikipedia.org/wiki/The\\_Decameron](http://en.wikipedia.org/wiki/The_Decameron). 6 pp.

### **Week 5**

Excerpts from: Carson, R. (1961). **Silent Spring**.

Chapter 4 And No Birds Sing, pp. XXX .

Excerpts from: Marco, G.J., R.M. Hollingworth and W. Durham (1987). Silent Spring Revisited, American Chemical Society, Washington, D.C.

## Chapters

1. *Rachel Carson : Her Vision and Her Legacy*, pp. 3-9
3. *The Science and Politics of Pesticides*, pp. 15-22.
8. *Analytical Chemistry of Pesticides: Evolution and Impact*, pp. 127-138.

## Week 6

Miller, G.L. (1997). Historical Natural History: Insects and the Civil War. *American Entomologist*. 43: 227-245.

## Week 7

Pemberton, R.W. (1999). Insects and other Arthropods used as Drugs in Korean Traditional Medicine. *J. Ethnopharmacol.* 65: 207-261.

Sherman, R.a., M.J.R. Hall, and S. Thomas (2000). Medicinal Maggots: An Ancient Remedy for Some Contemporary Afflictions. *Ann. Rev. Entomol.* 45: 55-81.

## Week 8

*Researchers Recommend Insect Meat* (2011). *Healthcare News*.  
<http://www.hc2d.co.uk/content.php?contentId=17352>, 1/28/2011.

## Week 9

Excerpts from: Lockwood, J.A., (2008). *Six-Legged Soldiers: Using Insects as Weapons of War*. Oxford Univ. Press, London, 400 pp.

Bee Bombs and Wasp Warheads, pp. 9-25.  
Entomological Evil, pp. 95-107.  
Insect Cyborg and Roboflies, pp. 287-297.

## Week 10

Excerpts from: Ramos-Elorduy, J. (1998). *Creepy Crawly Cuisine. The Gourmet Guide to Edible Insects*. Park Street Press, Rochester, VT., 150 pp.

Entomophagy Around the World, pp. 12-25.  
Nutrition and Entomophagy, pp. 38-51.

## Week 11

Kenyon, G. (2002). Insects Boost Immune System. *BBC News*, 2/0.02.

Cherniak, P. (2010). Bugs as Drugs, Part I: insects. The “New” Alternative Medicine. Altern. Med. Rev. 15 (2): 124-135.

### **Week 12**

Berenbaum, M.R., (2007). Colony Collapse Disorder and Pollinator Decline. Statement of M.R. Berenbaum, Professor and Head, Department of Entomology, University of Illinois before the Subcommittee on Horticulture and Organic Agriculture, U.S. House of Representatives, 3/29/07.

### **Week 13**

Allen, D.C. (1999). Insect-Produced Silk: from textiles to tents. The New York Forest Owner, 37: 6.

### **Week 14**

Lewis, E.B. (1998). Thomas Hunt Morgan and His Legacy. [http://nobelprize.org/nobel\\_prizes/medicine/articles/lewis/](http://nobelprize.org/nobel_prizes/medicine/articles/lewis/).

General Education Rationale

Entomology 2101

Insects and Human Affairs: Pests, Plagues, Poisons and Politics

**How do Learning Objectives address the GE category Expected Learning Outcomes:**

**Learning Outcome 1:** Students understand the basic facts, principles, theories and methods of modern science.

**Learning Objectives for Learning Outcome 1:**

Students will:

Understand the role of insects in establishing key biological theories such as the Germ Theory of Disease and the Modern Synthesis;

Understand the biological facts behind key components of insect physiology, morphology and the nervous system in sufficient detail that to permit evaluation of insect roles in disease transmission and other activities that affect the well-being of humans;

Develop testable, falsifiable hypotheses to explain how insects impact the world in recitation exercises.

**Learning Outcome 2:** Students understand key events in the development of science and recognize that science is an evolving body of knowledge.

**Learning Objectives for Learning Outcome 2:**

Students will:

Explore how the human desire to explain the natural world evolved from mythology to religions to scientific explanations of key phenomena e.g. the origin of the earth and the genesis of humankind;

Understand why efforts to control insects went through distinct eras that evolved from prayers to stop insect depredation of crops, excommunication of offending pests, chemical control of different types and ultimately a reduction on reliance on chemicals as ecological effects were identified and insect resistance to insecticides took root;

Understand the biology of using insects in medicine from ancient practices such as using insects to close wounds to modern use of maggots to debride wounds and insect venoms to fight devastating diseases like glioma.

**Learning Outcome 3:** Students describe the inter-dependence of scientific and technological developments

**Learning Objectives for Learning Outcome 3:**

Students will:

Examine the use of insects as weapons of war by investigating ancient to modern practices, focusing on technological aspects of incorporating insects into biological weapons;

Understand the psychology, nutritional analytics and technological impediments to using insects to feed a human population that faces significant food insecurity on a global basis;

Investigate the interaction between microbiology and the machinery needed for silk production in an effort to understand why the silk industry was imperiled in the 19<sup>th</sup> century;

**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 world.

**Learning Objectives for Learning Outcome 4:**

Students will:

Understand the neurobiology of fear of insects and the potential for effective therapeutic treatment of entomophobia, delusional parasitosis and illusionary parasitosis;

Be able to explain why insects repeatedly appear in divine texts, music and human dreams and explain the biological significance of these phenomena;

Articulate the effects of bubonic plague (and other insect-borne pandemics) on society with particular emphasis on the fecklessness of the institutions upon which we traditionally rely to relieve suffering e.g., clerics, politicians and physicians.

**A) How do the readings assigned address the GE category Expected Learning Outcomes?**

**Learning Outcome 1: Students will understand the basic facts, principles, theories and methods of modern science.**

The assigned readings were chosen to serve in place of a text as this is an area that lacks a suitable text book. The readings, thus, cover the basics as well as expand upon chosen themes.

Beginning in week 2, the Berenbaum and Hogue references were chosen to acquaint students with the basic entomology needed for success in the course. The Hogue reference expands the basic entomology to include how insects impact humans.

In week 14, the paper by Lewis recounts T. H. Morgan's quest to discover the source of genetic diversity upon which natural selection acts. This discovery of mutations in fruit flies was the basis of his work and provided the third pillar in the Modern Synthesis. All biology depends upon this understanding.



**Learning Outcome 2: Students will understand key events in the development of science recognize that science is an evolving body of knowledge.**

Week 1 readings are devoted to the role that mythology and religious texts had in the nascent understanding of how the world was created and humans' place in it. We trace the use of insects in myth, parables and fables as well as key portions of the Torah, Bible and Qur'an in helping students understand how and why insects played a significant role in this process. We finish with excerpts from Stephen Jay Gould's book that describes the modern scientific view of how the earth was formed and its unique features that permitted the evolution of life.

Another phenomenon that has undergone significant change as our understanding of biology increased is our ability to control insects which we consider pests. Methods for insect control prior to the 19<sup>th</sup> century can best be described as a "wing and a prayer." By the time of WWII, our ability to use chemicals to control insects gained precedence. This was changed radically as our understanding of the secondary effects of insecticides surfaced and evidence for insect resistance to insecticides grew. The major changes in perspective are covered in the readings for week 5 by Carson and Marco et al.

Insects have always played a role in medicine as horrible as that sounds. We will review ancient practices that use insects as therapeutants that are still sometimes used today and "modern" practices that continue to push the envelope. Among the later are anticancer drugs that may be effective in treating diseases such as glioma that have very high mortality rates. The readings from week 7 (Sherman et al. (2000)) covers historical aspects of entomology-based medicine. The two articles listed for week 11 (Kenyon 2002) AND Cherniak (2010) provide insight into emerging technologies that are based on insects.

**Learning Outcome 3: Students describe the inter-dependence of scientific and technological developments**

The use of insects as biological weapons of war has a long and storied history. Sometimes they worked. Sometimes, technological impediments prevent success. We will look at a variety of examples from the use of catapults to launch bee hives into enemy camps to insect cyborgs and roboflies---all topics covered during week 9 in several chapters from Lockwood (2008).

People around the world rely on insects as a food source. Even in the US, we willingly eat shrimp, lobsters and crabs. The FDA prescribes allowable insect levels in processed food demonstrating that even Americans are getting a significant level of insects in their diet. We undertake a nutritional analysis of eating crickets vs. cows and discover that eating crickets would be a much better nutritional choice. The readings (Ramos-Elorduy (1998) and Healthcare News (2011) ask the student to consider whether an insect-based diet should be promoted in western countries. If we did, what would be the technological impediments toward making insects available as a dietary choice on a much broader scale?

Silk production has been an important part of Asian, European and American economies. All silk production takes place in culture as silk moths no longer survive in sufficient numbers in the wild. The requirement for silk farms to mass produce silk invites a variety of technological problems that range from microbial challenges in mass rearing programs to efforts to extract and store the silk. The interface between science and technology is examined in week 13 using the paper by Allen (1999).

**Learning Outcome 4: Students recognize social and philosophical implications of scientific discoveries and understand the potential of science and technology to address the problems of the contemporary world.**

Technology holds the key to fixing a variety of human psychological problems involving insects. Entomophobia can be fairly easily treated and ameliorated with behavioral therapies. However, delusional parasitosis presents a problem of a different magnitude. Psychoactive drugs are largely ineffective as are virtually all other traditional therapies. Can technology help? We look at the prospects in week 7 with the article by Pemberton (1999).

There are nearly 100 references to insects in monotheistic religious texts. Why? Insects also appear routinely in music, art, literature and poetry where their function can be literal, allegorical or metaphorical. Why are insects such a rich source of inspiration? We use the species scope concept to make sense of this. Readings relevant to this undertaking are listed in Week 3.

Insects figure prominently in the human psyche because the ability of insects to vector deadly diseases to humans has been important determining the outcome of historical events. There are many examples from which to choose but the Black Death stands out as pivotal. The biology is compelling both when considered from the standpoint of medieval medicine and our modern understanding. We ask the student to consider how ancient people made sense of the plague. How did the failure of key professionals to stop the plague affect society? What is the potential for plague in modern times and what are the variables that would impact our response? The readings from Stassler (1998), Campbell (1921) and Wikipedia in week 4 cover various aspects of the problem.

**B) How do the topics address the GE category expected learning outcomes?**

**Learning Outcome 1: Students will understand the basic facts, principles, theories and methods of modern science.**

**Students will:**

**Understand the role of insects in establishing key biological theories such as the Germ Theory of Disease and the Modern Synthesis.** Many lectures have biological theories embedded in them as part of the discussion. For instance, we discuss basic Mendelian genetics in lecture 15 in learning about how insect resistance to insecticides resulted in the miracle insecticide, DDT, becoming useless. Darwinian evolution is a recurring theme in many lectures as well. However, there are two lectures (25, 26) that are devoted entirely to the explication of important scientific theories and how research done on insects was pivotal to their establishment;

**Understand the biological facts behind key components of insect physiology, morphology and the nervous system.....**Basic entomology is a recurring theme throughout all lectures. However, these concepts are specifically highlighted in lectures 4, 5,6,21 and 22. In addition the impact of basic entomology on human affairs is 3,5,7, 9, 11, 12, 13 and 14;

**Develop testable, falsifiable hypotheses to explain how insects impact the world.** Although hypothesis testing is generally the province of the recitation, there are occasions in lecture in which it becomes important. Once such occasion is in the lectures on how insects circumscribed

Napoleon's imperialistic ambitions (lectures 12, 13 and 14). The common view of history is that Napoleon was defeated by many factors of which insect-borne disease was but one. Students will be repeatedly asked to explain what kind of evidence would have to be adduced to support insect-borne disease hypothesis as a major cause of Napoleon's downfall. In addition, there are numerous occasions in lectures 25 and 26 to discuss the nature of science and how experimental work was the backbone of discovering the Germ Theory of Disease (lecture 25) and the biological source of variation leading to the Modern Synthesis (lecture 26).

**Learning Outcome 2:** Students will understand key events in the development of science and recognize that science is an evolving body of knowledge.

**Learning Objectives for Learning Outcome 2:**

Students will:

Explore how the human desire to explain the natural world evolved from mythology to religion to science. Lectures 2 and 3 develop this theme. Students will be asked to identify how human thought on the origin of the earth and human beings were depicted by ancient people. One inescapable conclusion is that insects were over-represented in explaining these phenomena. Why are insects so often used to explain both human origins and the origin of the universe? Here we introduce the species-scape concept and use it to explain the importance of insects as literal representations of the natural world as well as metaphorical and allegorical sign posts of ideas that are important to humans;

Understand why efforts to control insects went through distinct eras that changed from prayers to insecticide use.....Two lectures (15 and 16) cover the evolution of pest control from wishful thinking and divine supplication to the advent of chemical insecticides during WWII and the aftermath where chemicals used successfully in wartime were redeployed in agriculture and in world health campaigns. DDT is an exemplar of what happened next. Although hailed by Sir Winston Churchill as "the miraculous powder" and unquestionably changed the course of WWII, DDT was derided as "the elixir of death" by Rachel Carson in recognition of its environmental effects. The evolution of insect resistance to insecticides sealed DDT's faith, leading to the cancellation of its registration in 1970. The pesticide industry turned to other classes of chemicals, some of which survive today, to keep the industry going.

Understand the biology of using insects in medicine from ancient to modern practices..... We begin with an examination of the Doctrines of Signatures (Pliny the Younger) and progress through two millennia of using insects to treat disease (lectures 18, 23). Finally, the human genome project has allowed us to screen for genes that are common to insects and other organisms of interest, including humans. New ways of designing drugs, based on arthropod venoms, has given new hope for therapeutic drugs that can fight even the most recalcitrant human diseases (lecture 24).

**Learning Outcome 3: Students will describe the inter-dependence of scientific and technological developments.**

**Learning Objectives for Learning Outcome 3:**

Students will:

Examine the use of insects as weapons of war by investigating ancient to modern practices, focusing on technological aspects of incorporating insects into biological weapons. This theme runs through lectures 12, 13 and 14. While ostensibly directed at understanding why Napoleon didn't take over the world, it is an occasion for understanding how technology advanced certain causes, e.g., making it possible to host and arm a standing army and to send it far afield in quest of the emperor's goals but which was miserably lacking in other respects. There was no understanding, yet, that microbes caused disease and, consequently, no way to treat them. There was no way to deal with the human health issues occasioned by holding 1000's of soldiers in wretched conditions with poor sanitation, too little food and a lack of native resistance to endemic pathogens. The combination of these factors lead to disaster after disaster--- particularly when insect vectors could be counted on to transport pathogens efficiently from host to host in crowded conditions.

Understand the psychology, nutritional analytics and technological impediments to using insects as a food source--Lectures 20, 21 and 22 take up the issues of promoting entomophagy on a global basis. First stop is to understand the psychology and why eating insects is perfectly acceptable elsewhere in the world, ancient and modern, but is truly anathema to westerners despite a fondness for shrimp and lobster. Next, we perform a nutritional analysis to demonstrate that if you're interested in a low fat, high protein diet, insects are the way to go. Then, we look at energy flow through food chains and how that would be impacted, on a global basis, if humans ate crickets instead of cows. The final element to the discussion is to examine technological impediments to implementing a global entomophagy program.

Investigate the interaction between microbiology and the machinery needed for silk production, lecture 22. The only place that silk moths breed is in culture. However, maintaining both a parasite-free silk moth culture and designing equipment that will successfully unravel silk, which is produced by the insect in a single strand, is daunting. We look at how these technological challenges were overcome and why silk from cultures is demonstrably superior to silk obtained from wild sources.

**Learning Outcome 4: Students will recognize social and philosophical implications of scientific discoveries and the potential of science and technology to address human problems.**

**Learning Objectives for Learning Outcome 4:**

**Students will:**

Understand the neurobiology of fear of insects and potential for treatment. In lectures 7 and 8, students will study what happens when insects invade our fears and our dreams. What is the evolutionary explanation for fear of insects? What are the events in the nervous system that take place when we are faced with a scary thing with lots of legs? Does the neurobiology suggest some pathways for treatment? Differences in fear states from entomophobia to delusional parasitosis are examined. The representations of insects in dreams are also explored.

Be able to explain why insects repeatedly appear in divine texts, music, literature and poetry. Is this simply a case of proximity? Or does it speak to both our sense of wonder and our fear of creatures which can cause us harm but, at the same time, can explain so much about the world?

Articulate the effects of the bubonic plague and other insect-borne diseases on society-- Throughout human history, insects have appeared as harbingers of death owing to their capacity to vector disease. From representations of flies as Beelzebub in the Bible to the medieval scourge known as the Black Death, insects repeatedly have played the role of evil. How have human beings coped with this persist threat? How have technological advances affected this view? What kind of role will insects play in the future either as sources and distributors of pathogens or biological weapons? These issues are examined in lectures 9 and 11.

C) How do the written assignments address the GE category expected learning outcomes?

The written assignments for Entomology 2101 appear below along with an explanation of how each addresses the expected learning outcome:

1. There are **Four Major Recitation** exercises:

Week 2—creating an insect myth to explain some biological principle. This exercise is consistent with learning outcomes 1 and 2. The best way to instruct a student in important scientific principles is to ask them to explain one. This assignment will do that and ask the student to bring his or her creativity to bear in the process. Secondly, students will have to indicate where on the evolutionary trajectory from myth to religion to science their idea falls and why this is so.

Week 3—students will watch an insect-based horror film and compose a written analysis whether the entomological information was accurate or not. This written assignment will explicate the facts of entomology, a component of learning outcome 1.

Week 7—students will procure information about entomophagy in current societies around the world and compare the nutritional value of insect consumption to a typical western diet. Students will write an analysis that explains the benefits to humans of an insect-based diet as well as the energy investment needed to produce both the western diet and an insect-based one. They will be asked to explain the significance of their analysis to food security in a climate-challenged world. This assignment addresses learning outcomes 3 and 4.

Week 8—Students will analyze religious texts drawn from the Torah, the Bible and the Quran to discern which orders or families of insects it is permissible to eat in each religion. Then, students will be asked to address the biological basis, if any, for each prohibition. Finally, students will be asked to explain and resolve whether or not the Bible commits a biological error by suggesting that locusts have four legs and what this portends for biblical literalism. Collectively, this assignment addresses learning outcomes 1 and 4.

Students are required to complete a semester-long project on a subject of their choosing. There are 3 components to this assignment: a physical manifestation of their topic; a written 10-15 page paper and an oral presentation. The written paper could potentially address any of the four learning outcomes depending on which topic each student chooses and how they decide to put their project together. The instructions we give to the students ask that students choose and develop their topics in ways that will explicate each of the four learning outcomes. Each of the learning outcomes is described and the point value for each is listed on the rubric for this assignment (see Appendix B of the GE Assessment Plan). Because we want the papers, in particular, to be tightly connected to the learning outcomes,

we have set the project up in a way that requires close and repeated consultation with the GTA and the lecturer.

- D) How do the prerequisites provide an appropriate level of preparation for the course? There are no prerequisites for this course. The only prerequisite we considered was a basic entomology course. However, since sequences are no longer required, we decided to embed the necessary basic entomology into lectures or recitations so that students could take Entomology 2101 as a stand-alone course.
- E) What types of recitation experiences will the students have in this course? The recitation for this course is richer in format than a typical science course. We will, of course, have standard recitation experiences in which the students is asked to read some material, identify a testable hypothesis and discuss the importance of the work to the body of science. We are particularly interested in cultivating an understanding in students of what it means to be testable and falsifiable. There will also be a significant data analysis component to these recitations. Examples of this type of recitation are weeks 4, 5 6 and 10. During other recitations, however, the experience will be more observational (weeks 2,7 and 9). Here again, students will be presented with an entomological problem, be asked to read relevant literature and then propose an hypothesis to explain the phenomenon. Thereafter, students will be presented with a variety of either live or preserved specimens to gather data to refute or support their hypothesis. In weeks 3 and 8, students will have a third kind of experience. They will be asked to evaluate biological phenomena through a cultural lens and evaluate whether the cultural result is faithful to science. While this may sound a bit unusual, it is actually one of the more important things we can do in this course. Students misapply and misinterpret science all the time. This type of recitation is designed to get them to think about what is evidence-based and what is a matter of opinion.



Entomology 2101 GE Assessment Plan

GE Learning Objective	Direct Methods	Indirect Methods
1. Students understand the basic facts, principles, theories and methods of modern science.	Embedded questions on exams <sup>1</sup>  Analysis of semester-long papers <sup>2</sup>	SALG <sup>3</sup>  Analysis of Student Discussion <sup>4</sup>
2. Students understand key events in the development of science and recognize that science is an evolving body of knowledge.	Embedded questions on exams  Analysis of semester-long papers	SALG  Analysis of Student Discussion
3. Students describe the inter-dependence of scientific and technological developments.	Embedded questions on exams  Analysis of semester-long papers	SALG  Analysis of Student Discussion
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.	Embedded questions on exams  Analysis of semester-long papers	SALG  Analysis of Student Discussion

<sup>1</sup> On each lecture exam and the final, several questions will be written specifically to assess student comprehension of each learning outcome using Bloom's Taxonomy. The scores on these questions will be included in the totals for the exam but will also be analyzed separately so that the data can be used in revising the course. Examples of questions with graduated content according to Bloom's are provided in the Appendix A of this document.

<sup>2</sup>In the Semester-Long Paper, the student has the opportunity to demonstrate mastery of learning outcomes on a project of his own choosing. Elements that reprise the four learning goals have been written into the rubric for the semester-long paper, the rubric for which is found in Appendix B of this document.

<sup>3</sup>The Student Assessment of Learning Gains (SALG <http://www.wcer.wisc.edu/salgains/ftp/SALGPaperPresentationAtACS.pdf>.) uses a Likert scale for assessing student perception of courses. In addition, SALG asks students to self-assess whether they have met the GE learning objectives for this course. The SALG will be used as noted above in conjunction with other indirect methods of assessing progress towards securing the GE Learning Outcomes. Examples of SALG questions can be found in Appendix C of this document.



<sup>4</sup>Discussion is an extremely important part of this course because it allows for the student to articulate his/her own thoughts and is, therefore, a superb opportunity for us to assess student understanding. A rubric for judging the quality of student understanding, joined with a record of attendance, appears in Appendix D of this document. In addition to evaluating understanding of learning outcomes, we will be looking for progress in depth of understanding for each student.

**Explanation of level of student achievement expected.** In general, for exams, success means that students will answer 75% of the embedded GE questions correctly. For essays, the 10-15 page written paper and the graded recitationwritten assignments, the students will be provided with rubrics for each assignment. Success is a 75% score on the written assignments. For discussion, the 75% criterion is also used.

**Description of follow-up/feedback processes.**

At the end of the course, we will use SEI information as well as an analysis of each graded component of the course to identify problem spots and how we might change the course and the presentation of materials to address these problems. We will also analyze the SALG questions carefully to judge how students evaluated their own progress to determine whether student perception meshed with performance. If there is a conflict, we will adjust the presentation and assessment of material as warranted. We will archive these end-of-semester analyses in the instructor's office so that we can gauge whether any changes made were effective. These evaluations will be discussed with the curriculum committee when the effectiveness of courses is evaluated.

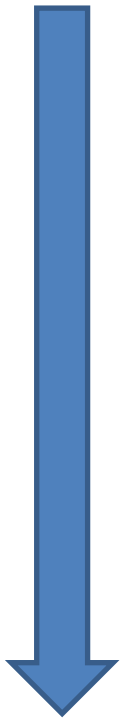
Appendix A

Entomology 2101

Embedded GE Exam Questions

**Examples of embedded questions designed to test learning outcome 1 using Bloom's Taxonomy: Students understand the basic facts, principles, theories and methods of science:**

Bloom's  
Hierarchy



**Comprehension**

1. Which of the following statements accurately **describes** a scientific hypothesis:
  - a. in science, an hypothesis is a fact
  - b. an hypothesis explains many phenomena and is generalizable
  - c. hypotheses cannot be tested.
  - d. an educated guess about why something occurs that is testable and falsifiable.

**Application**

3. A detergent company claims that its laundry soap OhSoClean is superior to all other brands. To demonstrate its superiority, the company produced a commercial in which two badly soiled shirts were placed in different washing machines. One shirt was treated with OhSoClean while the other shirt was washed with another major brand. After viewing the washed shirts, the makers of OhSoClean announced that their product was the definitive winner. Using your knowledge of hypothesis testing, why might you have reason to question the claim that OhSoClean was more effective in cleaning the shirts?
  - a. We don't know if the same amount OhSoClean vs. the other detergent was used to clean the shirts, whether the shirts were washed for the same amount of time and if the shirts were washed at the same temperature.
  - b. Judging the cleanliness of the washed shirts is subjective and it might be hard to quantify.
  - c. A sample size of one shirt in one trial is not enough to draw sweeping conclusions.
  - d. Any of the above could be used to question the results of OhSoClean's claims.

## APPENDIX B ENTOMOLOGY 2101

### GRADING RUBRIC FOR SEMESTER-LONG PAPER

<b><u>Topic submission</u></b>	<b><u>5 pts.</u></b>	
<ul style="list-style-type: none"><li>• This should be a one paragraph summary of the issue you plan to address in your paper. It should be submitted either in person or on Carmen (dropbox) DUE IN RECITATION, WEEK 4</li></ul>		
<b><u>Outline</u></b>	<b><u>10 pts.</u></b>	
<ul style="list-style-type: none"><li>• This should be (at a minimum) a rough outline of your paper and include the topics you plan to address in the body of the text as well as supporting evidence you have found in the literature. This does not need to be longer than one to two pages. DUE IN RECITATION, WEEK 6.</li></ul>		
<b><u>Draft of the paper</u></b>	<b><u>10 pts.</u></b>	
<ul style="list-style-type: none"><li>• The draft of your paper should be a fairly complete version of the paper. For full credit, the writing and grammar do not need to be perfect (although it should be readable). The main objective is for you to have written a nearly complete paper which we can read, and give you feedback that will help you polish up your final draft of the paper. DUE IN RECITATION, WEEK 9.</li></ul>		
<b><u>Final draft</u></b>		
<b>Cover/Title Page:</b>	<b>3 pts.</b>	
Should Include:		
<ul style="list-style-type: none"><li>• Names, Recitation Section, Brief Description of Topic, and Date.</li></ul>		
<b>Page Layout:</b>	<b>3 pts.</b>	
<ul style="list-style-type: none"><li>• Typed, One and One-Half Spaced, 12 Point Font, 1 Inch Margins.</li><li>• Pages Numbered</li></ul>		
<b>Introduction:</b>		
<ul style="list-style-type: none"><li>• Overview of the general issue, approximately ½-1 fullpage</li></ul>		<b>5 pts.</b>
<ul style="list-style-type: none"><li>• <b>Presentation of scientific fact, theory or principle to which your subject relates</b></li></ul>		<b>5 pts.</b>
<b>Literature Review and Discussion:</b>	<b>33 pts.</b>	
<ul style="list-style-type: none"><li>• Make sure paragraphs are well organized (i.e.- have topic sentences, logical flow of content etc.)</li><li>• Cite each source you use.</li><li>• DO NOT PLAGIARIZE—Consult with Dr. Fisher if you have questions.</li><li>• At Least 5 to 8 pages long</li></ul>		
<b>Conclusion:</b>	<b>10 pts.</b>	
<ul style="list-style-type: none"><li>• Conclude your discussion.</li><li>• This is not a place to introduce new info!</li><li>• <b>Connection to key events in science and example(s) of interdependence between science/technology</b></li><li>• <b>Philosophical implications of work &amp; relationship to contemporary world problems</b></li></ul>		<b>7 pts</b> <b>3 pts</b>
<b>Reference Page:</b>	<b>3 pts.</b>	
<ul style="list-style-type: none"><li>• Please Use Proper Reference Formatting (Either MLA or APA format.)</li><li>• Include a minimum of 5 credible references (books, journal articles, videos, legitimate web resources)</li></ul>		
<b>Grammar, Spelling, and Overall Presentation:</b>	<b><u>3 pts.</u></b>	
<b>Total Points:</b>	<b>100</b>	

## Appendix C

### Entomology 2101


#### Examples of SALG Questions Adapted from Biology 2100

1. 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 and the scientific method
- Historical aspects of entomology
- 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/entomology on society
- Scientific ethics and practices

Please comment on how this class has CHANGED YOUR ATTITUDES toward this subject.

**APPENDIX D**  
**ENTOMOLOGY 2101**  
**SLIDING RUBRIC FOR GRADING ATTENDANCE AND DISCUSSION**

GRADE	ATTENDANCE (MISSES)		PARTICIPATION FREQUENCY	DISCUSSION QUALITY
A	0 - 1		Talked and listened well and with judgment	Relevant; Regularly connected readings, lectures, discussions, opinion makes full and creative use of content; <b>Clearly understands learning outcomes.</b>
B	2		Talked and listened fairly well; may have been occasionally reticent or occasionally dominating or occasionally off topic	Usually relevant; Some connections among readings, lectures, discussions, opinions generally based in content; <b>Some evidence of understanding learning outcomes.</b>
C	3		Some trouble balancing talking and listening, and/or not listening well, not talking guidance well, may have occasional distracting behaviors	Generally relevant; occasionally connecting among readings, lectures, discussions, sometimes expresses unfounded opinion; <b>Rarely shows evidence of understanding learning outcomes.</b>
D	4		Poor job of balancing talking and listening and/or not listening well, not talking guidance well, engages in distracting behavior more than occasionally	Superficial and/or unfounded comments, off topic comments; <b>No evidence of understanding learning outcomes.</b>
F	5 or more			

This is a sliding rubric. The two left-side columns are permanently locked in relationship to each other. In so doing, they establish the upper level for grades based on absences. The right side columns are similarly linked with each other, but they can slide down so that the top rating of the right side aligns with the number of absences. For example, a student who misses 3 class sessions would have to have an "A" grade for participation frequency and quality in order to receive a "C" grade overall.



