Term Information

Effective Term	Summer 2012

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

Readjust components and reapprove as GE Nat'l Science without lab.

What is the rationale for the proposed change(s)?

We are requesting to change HCS 2200 from lab to non-lab designation. The course has evolved from its earliest days as Agronomy 200 when it was a study of the processes and procedures to grow field crops to a much broader scope that includes many other plant commodities. The original labs addressed the issues that were more or less specific for field crop production. With the broadening of commodity focus, it has become much more difficult to create labs that represent the different commodities in a meaningful way. The labs have become less relevant and less effective at reinforcing learning even though many attempts have been made to keep them relevant/effective.

Several recitation periods will have the students performing tasks that allow them to practice how information is derived, evaluated, and used in the growing of plants.They will be required to record their observations/data, analyze it, and report their findings. Activities are described in the syllabus.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

This does not affect any program other than the designation as non-lab course. Resource need is reduced slightly, mainly in consumable supplies such as fertilizer and growing media.

Is approval of the requrest contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Horticulture and Crop Science
Fiscal Unit/Academic Org	Horticulture & Crop Science - D1127
College/Academic Group	Food, Agric & Environ Science
Level/Career	Undergraduate
Course Number/Catalog	2200
Course Title	Science of Sustainable Plant Production
Transcript Abbreviation	SciSustainPlntProd
Course Description	Study of the cultivation, environmental, genetic, and social/cultural factors which influence the sustainable production of plants for food, fiber, ornamental and recreational uses.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 7 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	Yes
Is any section of the course offered	Greater or equal to 50% at a distance Less than 50% at a distance
Grading Basis	Letter Grade
Repeatable	No

Course Components	Lecture, Recitation
Previous Value	*Laboratory, Lecture, Recitation*
Grade Roster Component	Lecture
Credit Available by Exam	Yes
Exam Type	EM Tests via Office of Testing
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites	
Exclusions	Not open to students with credit for 200.

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	01.1103
Subsidy Level	Baccalaureate Course
Intended Rank	Freshman, Sophomore, Junior
Previous Value	*Sophomore, Junior*

Quarters to Semesters

Quarters to Semesters	Semester equivalent of a quarter course (e.g., a 5 credit hour course under quarters which becomes a 3 credit hour course under semesters)
List the number and title of current course being converted	HCS 200: The Science of Growing Plants.

Requirement/Elective Designation

Required for this unit's degrees, majors, and/or minors

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

- Analyze and describe the fundamental concepts of successfully growing plants.
- Evaluate how environmental, economic, social, and other factors interact and influence why and how plants are grown.
- Describe how the interactions of the components of stable natural ecosystems can be used to create successful, sustainable ecosystems of crops, landscapes, golf courses, and athletic fields.
- Evaluate the role plants play in our lives and describe many of the specific plants that fill those roles.
- Be able to apply what is learned in this class to other classes and toward success in their careers or for greater enjoyment of an avocation.

Content Topic List

- Introduction: Why study the growing of plants, the value of growing plants, the history of growing plant and nomenclature.
- Plant science research
- Climatic factors that affect plant growth
- The ecological basis of plant growth including how human activity affects our ecological footprint
- Plant Anatomy: Vegatative and reproductive structures, flowers, fruits, and classifications of plant anatomy
- Genetic Resources: Sexual and asexual reproduction, Diversity, breeding strategies, Genetically modified plants.
- Carbon Flow: Photosythesis and Respiration
- Soils
- Crop Mineral Nutrition
- Pests and Diseases: Integrated Pest Managment, Growing Degree Days
- Plant Growing Systems: Conventional, Organic, Sustainable
- Applications and Vocations: Field crops, Nursery, Floriculture, Turfgrass, Landscaping
- Applications and Avocations, Master Gardeners, Home Gardening

Attachments

- 2200 SyllabusNoLab.docx: Syllabus

  (Syllabus. Owner: McMahon,Margaret Jane)
- GEModelComplianceStatement.docx: GE Curriculum Compliance

  (GEC Model Curriculum Compliance Stmt. Owner: McMahon,Margaret Jane)
- GEAssessmentPlan.docx: GE Course Assessment Plan

  (GEC Course Assessment Plan. Owner: McMahon,Margaret Jane)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	McMahon,Margaret Jane	04/18/2012 04:17 PM	Submitted for Approval
Approved	Pfister,Jill Ann	04/26/2012 03:05 PM	Unit Approval
Approved	Pfister,Jill Ann	04/26/2012 03:06 PM	College Approval
Pending Approval	Nolen,Dawn Jenkins,Mary Ellen Bigler Meyers,Catherine Anne Vankeerbergen,Bernadette Chantal Hogle,Danielle Nicole Hanlin,Deborah Kay	04/26/2012 03:06 PM	ASCCAO Approval

Syllabus
Horticulture and Crop Science 2200
The Science of Sustainable Plant Production
3 Credit Hours:

Welcome to the course!

This course fulfills the GE requirement 2. Breadth, A. Natural Sciences without a lab.

Instructor: HCS Faculty Member
Office:
Phone:
Office Hours:
Email:

Teaching Associate: HCS Staff or GTA
Office Hours:

Lecture and Recitation: TBA
2 1-hr classes and 1 1-hr recitation per week

Final examination: University Schedule

Course Description: Study of the cultivation, environmental, genetic, and social/cultural factors which influence the sustainable production of plants for food, fiber, ornamental and recreational uses. GE Natural Science Elective, non-lab.

Purpose:
This class gives students interested in the growing of plants and crops for food, fiber, ornamental, and recreational use the basic understanding of the environmental, cultivation, genetic, and social factors that influence how and why plants are grown. Students are introduced to the ecological foundations that are the basis of successful plant growing systems. Students are encouraged through interactive discussions and hands-on activities to develop skills needed to make informed decisions about the growing and utilization of plants and crops. In addition, students develop an appreciation for the contribution that cultivated plants make to the environment and humanity. Perhaps it is the last "purpose" that will most affect many of the students taking H&CS 2200. Human life is inextricably inter-twined with plants, both directly and indirectly. The knowledge students gain from HCS 2200 will help them make wise decisions about plants that will positively impact the well-being of all organisms on earth.

Course Learning Outcomes: Upon successful completion of H&CS 2200 a student can:

- Describe the scientific principles used to successfully growing plants.
- Evaluate how environmental, economic, social, and other factors interact and influence why and how plants are grown.
- Describe how environmental factors are measured and/or manipulated to predict or direct the growth of cultivated plants.
- Describe how cultivated plants are developed through selection, breeding, and other forms of genetic manipulations.
- Describe how the components of stable natural ecosystems can be used or mimicked to create successful, sustainable ecosystems of crops, landscapes, golf courses, and athletic fields.
- Describe the role plants play in our lives and many of the specific plants that fill those roles.
- Apply what is learned in this class to other classes and toward success in their careers or for greater enjoyment of an avocation.

Goals of GE Natural Science:

Students gain understanding of 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 GE Learning Outcomes:

1. Students understand the basic facts, principles, theories and methods of modern science.
2. Students learn key events in the history of science.
3. Students provide examples of the inter-dependence of scientific and technological developments.
4. Students discuss social and philosophical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

HCS 200 meets these outcomes by having students learn the science-based principles of growing plants. The course includes the history of the scientific discoveries that have changed the methods of growing plants over thousands of years, *i.e*. the change from simple hand-held farming implements, to the use of farm animal then steam driven machinery, to the highly complex machinery of today that includes sophisticated sensors and satellite guidance systems. The evolution of crop improvement strategies from the selection of visually superior plants by the earliest farmers, to deliberate attempts to get specific genetic traits through breeding of sexually compatible plants, to the use of genetic engineering to move genes from one sexually incompatible species to another. Students learn why the interactions of biotic and abiotic factors that influence plant growth have to be understood to not only grow plants productively but to conserve resources and protect the environment from degradation. For all topics, the implications of discoveries to address contemporary problems as well as any controversy associated with the topic is included as part of the topic.

Reference:

Plant Science, 5th edition. McMahon, Margaret J., Anton M. Kofranek, Vincent E. Rubatzky**.** 2011 ISBN 978-0-13-501407-3, Pearson Education (Prentice Hall) 674 pp.

Additional readings will be posted on Carmen or given to students as hardcopies. Some examples of additional readings are:

Chrispeels, Maarten J. and David E. Sadava. 2003. Plants, Genes, and Crop Biotechnology, Chapter 4, Food Security: Why Do Hunger and Malnutrition Persist in a World of Plenty (pp 76-99); Chapter 13, Ten Thousand Years of Crop Evolution (pp 328-359). Jones and Bartlett, Sudbury, Mass.

Heaton, Emily A., Nicolas Boersma, John D. Caveny, Thomas Voigt, Dohlerman. 2012. Miscanthus for Biofuel Production. Cooperative Extension Service. http://www.extension.org/pages/26625/miscanthus-for-biofuel-production

Herms, Daniel. 2006. Ohio Emerald Ash Borer Fact Sheet. Ohio State University Extension Publication.

Myhr, A. and T. Traavik. 2001. The Precautionary Principle: Scientific Uncertainty and Omitted Research in the Context of GMO Use and Release. Journal of Agricultural and Environmental Ethics Volume 15:1 pp 73-86.

Powers, Laura E., and Robert McSorley. 2000. Ecological Principles of Agriculture. Chapter 15, Water Conservation and Irrigation Politics (pp308-327). Delmar, Albany, New York

Class Materials

HCS 2200 lecture notes and recitation materials will be available online through the Carmen website, or in a few cases provided as hardcopies These will be posted or handed out several days prior to the class in which they will be needed. It will be the student's responsibility to print the electronic materials that will be needed in class. Other course information will also be posted to Carmen. Course announcements will be posted on the News section of the course home page of the Carmen site and emailed using the Carmen email system so make sure your email is set-up to get your *name.xx.@buckeyemail.osu.edu* account.

Topics: (Time is an estimation, topics may start or end the previous or following week.)

Week 1 Introduction ..... Complementary reading: Plant Science Chap. 1, pp 2-11
Plant Science Research..... Complementary reading: Plant Science Chap.1, pp 11-15

Week 2 Plant Growth and Development ..... Complementary reading: Plant Science Chap. 7

Week 3 Ecological and Sociological Basis of Growing Plants .... Complementary readings: Plant Science Chap. 2, pp 17-28 and selected article

Week 4 Human Footprint & Growing Plants Complementary readings: Plant Science Chap. 2, pp 29-30 and selected article

Week 5 Climate and Plant Growth ..... Complementary reading: Plant Science Chap. 4
Review for midterm (lecture before midterm)
Midterm 1 during recitation

Week 6 Climate, cont'd
Soil – It's a Whole Lot More than Dirt .. Complementary reading: Plant Science Chaps. 5 & 14 pp 267-281

Week 7 Soil, cont'd
Plant genetic resources – diversity, manipulation, and preservation of plant germplasm (a.k.a. diving into the plant gene pool)..... Complementary reading: Plant Science Chap. 9 and selected article

Week 8 Plant genetic resources, cont'd.

Week 9 Photosynthesis and Respiration (carbon cycle and energy flow)... Complementary reading: Plant Science Chap. 11 and selected article

Week 10 Photosynthesis and Respiration (cont'd)
Review for midterm (lecture period before recitation)
Midterm 2 during recitation

Week 11 Mineral Nutrients – Role and Sources.... Complementary reading: Plant Science Chaps. 13 & 14, pp 288-293

Week 12 Mineral Nutrients, cont'd.
Pests and Diseases – Impact and Control… Complementary reading: Plant Science Chap. 15 and selected article

Week 13 Pests and Diseases, cont'd.
Plant Growing Systems: Conventional, Organic, Sustainable
Complimentary reading: Plant Science Chap. 16

Week 14 Plant Growing Systems, Cont'd
Career Possibilities

Final Examination Determined by university schedule

Recitation Activities.

Week 1	Grower Challenge (quarter long project growing plants and recording and analyzing growth conditions as they relate to the appearance of the plant at the end of the project) .
Week 2	Organic vs Inorganic – Which is more appealing to you? Vegetable & fruit taste test and data collection and analysis by students.
Week 3	Ceremony and Symbolism in Plants – Science behind the use of plants in ceremony and symbolism. Written report on symbolic or ceremonial plant use including: botanical characteristics and taxonomy, what region or group of people used the plant, scientific basis for its use (e.g. taxonomy/morphology, growth characteristics, aromatic chemicals, pharmaceutical chemicals, etc.) .
Week 4	Written analysis of personal ecological footprint (homework) and examination of the footprint of various plant growing methods in class.
Week 5	Midterm
Week 6	Using the phenology chart from the Ohio Agricultural Research and Development Center (OARDC) and Growing Degree Data for Columbus Ohio to predict the flowering of several perennial plants (fruit and ornamental trees, herbaceous ornamentals such as tulips, etc.) and how this affects production practices, pollinators, tourism (e.g. Cherry Blossom Festival, Washington, DC), and other things dependent on the flowering of plants outdoors.
Week 7	Analyzing and evaluating soil texture for potential for agricultural productivity and vulnerability to degradation.
Week 8	Plant GMO's – Garden of Good or Evil? Evaluation of the arguments surrounding the use of genetic engineering in the plants we use.
Week 9	Grower Challenge Display and Crop Record Turn In and Review
Week 10	Midterm
Week 11	Examination and evaluation of nutrient deficient plants with a report giving recommendations for correcting the problem.
Week 12	*They're Coming* and I Have to Know When! – Using Ohio weather data and the Ohio Agricultural Research and Development Center (OARDC) phenology chart to predict insect pest emergence to plan the timing for effective use of control measures.
Week 13	Discussion of pros and cons of different types of plant growing systems by evaluating their production efficiency, environmental compatibility, economic viability, and social responsibility.
Week 14	Review for final exam.

Assessment of Learning:

Criteria	**Percent**
Midterms (2)	30 (*15 each)*
Final Exam	20
Lab Activities	25
Quizzes	10
Grower Challenge	10 (3 plant appearance, 7 growing record)
Self evaluation of effort to learn	5

Recitation activities:

Recitation activities are designed to reinforce through a hands-on activity and writing exercise the concepts being taught in the course. Recitation activities cannot be made-up unless there is a verifiable and acceptable excuse (determined by the instructor) Make-up activities must be completed within 3 days of being given to the student.

Attendance:
Students are **strongly** encouraged to attend all class meeting times. Please try to arrive on time and not leave early to avoid interrupting the class and instructor. If you have a recurring conflict that causes chronic lateness or need to leave early, make arrangements with the instructor on how to handle the conflict.

Class participation:
Although the instructor and TA assume responsibility for the instruction in this class, each student in this class brings relevant personal experience (life or classroom) to the subject matter. Students are asked to share with the class these experiences if they feel comfortable in doing so. There is a very wide range of interest and academic rank among the students in this class. Therefore, students who are further along in the HCS majors are encouraged to provide assistance to those students less advanced in those majors or from non-HCS majors.

Grading:								
	A	93-100	B+	88-89	C+	78-79	D+	68-69
	A-	90-92	B	82-87	C	72-77	D	60-67
			B-	80-81	C-	70-71	E	≤59

All grades that have a decimal extension ∃.50 will be rounded up. A decimal #.49 will not be rounded up.

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Students impacted with a disability are encouraged to inform the instructor at the beginning of the term. We will work with the Office of Disability Services located in 150 Pomerene Hall, 1760 Neil Ave; Ph.: 292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/ to provide the necessary services.

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Academic Integrity:
In H&CS 2200, class courtesy and respect for others will be given by all participants (including instructors, teaching assistants, students, and guests) in the class at all times. Respect includes paying attention and not using cell phones and other electronic devices etc. and not talking or otherwise causing a distraction when the instructor or someone else is speaking.

An environment that fosters free, non-confrontational expression of ideas will be maintained. H&CS 2200 is a class that put the student in situations where individual and team effort is required. Students will put forth the appropriate kind of effort for each situation. H&CS 2200 operates on an honor system that trusts you to respect the academic standards of this University. When you submit assignments we expect them to be entirely your own original work. Academic misconduct such as plagiarism, cheating, and other dishonest practices will not be tolerated. Any instances of student misconduct or suspected academic misconduct will be handled according to policies of the Code of Student Conduct in the Student Handbook or Faculty Rule 3335-5-487. If you are in any doubt please consult the University code on Academic Misconduct.

Course Change Proposal: HCS 2200 The Science of Sustainable Plant Production

GEC (GE) Model Curriculum Compliance Statement for HCS 2200, *The Science of Sustainable Plant Production*

Plant science is an integrative view of the relationship of plants with humans that incorporates many disciplines of the natural sciences (plant biology, ecology, bio/chemistry, agronomy and horticulture) with those of the social sciences (anthropology, geography, economics, and political science). This inclusive view of plant science is readily apparent with a quick perusal of the topics contained in the table of contents of the three main plant science textbooks used in the past 25 years[1]. HCS 2200 (*The Science of Sustainable Plant Production*) provides an introduction to the natural science component of plant science as it relates to the cultivation of plants to meet society's needs and desires. HCS 2200 introduces students to the concepts and terminology associated with the production of plant commodities for uses that include food, fiber, animal feed, ornamentation, and recreation. The course is designed to fulfill the GEC (GE) Natural Science category.

1. How do the course objectives address the GEC (GE) category expected learning outcomes?

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

In HCS 2200, students gain an understanding of the foundations of modern plant science by studying: the environmental factors (light, temperature, water, soil and nutrients, and atmosphere) that influence how plants grow; plant diversity, genetic manipulation, and the evolutionary forces that affect species development over time; principles governing ecological relationships within and among species of cultivated plants and other organisms. They also learn the basics of scientific inquiry in plant science research.

Learning Outcome 2. Students learn key events in the history of science.

The course includes the history of the scientific discoveries that have changed the methods of growing plants over thousands of years. Examples include the change from simple hand-held farming implements, to the use of farm animal then steam driven machinery, to the highly complex machinery of today that includes sophisticated sensors and satellite guidance systems. The evolution of crop improvement strategies from the selection of visually superior plants by the earliest farmers, to deliberate attempts to get specific genetic traits through breeding of sexually compatible plants, to the use of genetic engineering to move genes from one sexually incompatible species to another is another topic extensively covered. Also put into historical

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[1] Barden, J.A., R.G. Halfacre, D.J. Parrish (1987) ***Plant Science***. McGraw-Hill, Inc.
Janick, J., R.W. Schery, F.W. Woods, V.W. Ruttan (1981) ***Plant Science. An Introduction to World Crops***, 3rd ed. W.H. Freeman & Co.
McMahon, M.J., A.M. Krofanek, V.E. Rubatzky, eds. (2011) ***Plant Science. Growth, Development, and Utilization of Cultivated Plants***, 5th ed. Pearson Education.

context is the development of our understanding of how environmental factors affect plant growth and our ability to manipulate those factors.

Learning Outcome 3. *Students provide examples of the inter-dependence of scientific and technological developments.*

Advances in plant science are predicated on the application of basic research to the development of technologies used in the cultivation of plants. By taking HCS 2200 students will be able to make the connection between science and technology. For example, they learn how modern equipment combines our knowledge of plant physiology with sophisticated sensing equipment and GPS/GIS guidance systems as well as other cutting edge technology to very precisely plant and harvest or maintain our plants, apply fertilizers, control pests, and perform other cultivation practices profitably while protecting the environment and being socially responsible.

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

HCS 2200 addresses issues in plant science that are of enormous importance to society. For example, students will understand the reasons for, and implications of, many of the key issues of the day associated with the cultivation of plants such as global hunger in spite of the production of sufficient food, environmental degradation (*e.g*. soil erosion, water contamination, invasive species, organic vs. conventional production practices), global climate change, and the controversy surrounding genetically engineered plants. Students develop awareness of how plant growing practices have both negatively and positively affected human well-being and the health of the environment and how the negative effects are being corrected. Knowledge of the scientific basis for sustainable plant growing practices will be an important component of the ability of students to formulate informed opinions and engage in fruitful debate those issues listed above as well as others.

2. How do the readings assigned address the GEC (GE) category expected learning outcomes?

The assigned readings will be from the required textbook:
McMahon, M.J., A.M. Krofanek, V.E. Rubatzky, eds. 2011) Plant Science: Growth, Development, and Utilization of Cultivated Plants, 5th ed. Pearson Education).
Each lecture topic has readings assigned from the text that are noted in the syllabus. The readings reinforce lectures and recitation exercises and provide supplemental material that enhance the learning experience.
Additional readings taken from current primary and secondary literature will provide an even more robust learning experience. Some examples of additional readings are:

> Chrispeels, Maarten J. and David E. Sadava. 2003. Plants, Genes, and Crop Biotechnology, Chapter 4, Food Security: Why Do Hunger and Malnutrition Persist in a World of Plenty (pp 76-99); Chapter 13, Ten Thousand Years of Crop Evolution (pp 328-359). Jones and Bartlett, Sudbury, Mass.

Heaton, Emily A., Nicolas Boersma, John D. Caveny, Thomas Voigt, Dohlerman. 2012. Miscanthus for Biofuel Production. Cooperative Extension Service. http://www.extension.org/pages/26625/miscanthus-for-biofuel-production

Herms, Daniel. 2006. Ohio Emerald Ash Borer Fact Sheet. Ohio State University Extension Publication.

Myhr, A. and T. Traavik. 2001. The Precautionary Principle: Scientific Uncertainty and Omitted Research in the Context of GMO Use and Release. Journal of Agricultural and Environmental Ethics Volume 15:1 pp 73-86.

Powers, Laura E., and Robert McSorley. 2000. Ecological Principles of Agriculture. Chapter 15, Water Conservation and Irrigation Politics (pp308-327). Delmar, Albany, New York

Different readings may be selected each term. All selections will be at a high enough level to challenge the students but not so high that a typical student would not be able to comprehend them. The readings will be provided to students on Carmen or in hardcopy format.

3. How do the topics address the GEC (GE) category expected learning outcomes?

The topics are aligned with the course learning objectives which in turn align with the GEC/GE learning outcomes. Therefore the response to Question 1 above also addresses this question.

4. How do the written assignments address the GEC (GE) category expected learning outcomes?

HCS 2201 will provide a number of opportunities for students to present written communications. First, both the midterms and the final exam will contain short answer (a paragraph) questions. The exam questions will assess the student's understanding of broad concepts by asking questions that require integration of facts and knowledge. Second, the writing assignments associated with several recitation activities will provide students with an opportunity to develop analytical and critical thinking skills as well the ability to graphically present quantitative information in a clear manner. Finally the "grower challenge" will require the student to observe the conditions under which their plant is growing and formulate an hypothesis explaining how those conditions are related to the appearance of the plant at the time the challenge is terminated as well as suggestions for improving the conditions if necessary.

5. How do the prerequisites provide an appropriate level of preparation for the proposed course? If there are no prerequisites, please indicate how this is consistent with the proposed level of the course.

No prerequisites are required for HCS 2200. While the material covered in HCS 2200 is presented in an introductory manner, the breadth of the material and the speed at which it is covered the material is consistent with the 2000 level designation.

6. What type(s) of experiences will students have in the laboratory component of the course?

We are requesting non-lab status for the course.

Course Assessment Plan for HCS 2200

As developed in consultation with the Academic Affairs Committee in the Department of Horticulture and Crop Science, HCS 2200 will be reviewed and assessed through the following mechanisms:

1. Discursive evaluations of the course by students
2. Embedded testing in the midterm and final exams
3. Review of course syllabi and other instructional materials for each time the course has been taught up to the point of assessment (every 3 years, or sooner if a problem is indicated in a review)
4. Portfolio of sample student work
5. Written report of peer evaluator

Items 1-5 will be maintained on file in the department office in Columbus and with the instructor so that the progress of the course can be monitored and evaluated across time as the course evolves and to enable the department to address any major concerns or drift from the established goals and standards.

Item 2. Embedded testing.

The exams from each time the course is offered will contain several similar questions that address GEC (GE) Natural Science, departmental, and course learning objectives. Comparisons will be made between course offerings in terms of content and cumulative scores on the embedded questions.

Item 4. Review of course material.

A copy of the syllabus, exams, the instructions for the recitation exercises will be kept on file in the department office to review prior to the next offering and as a resource for the peer evaluator.

Item 5. Portfolio of sample student work.

Six copies of the grower challenge report as well as other activity reports and selected exam questions, with one copy representative of work that received a grade of A, B, C, etc. If there is more than one activity instructor, six copies will be collected from each section to evaluate uniformity in grading between sections.

Item 6. Peer evaluation.

The course will be evaluated by a faculty colleague in a manner consistent with current HCS policy (every 2 to 3 years). The evaluation will contain at least one lecture visit and one recitation visit. A copy of the written evaluation will be kept with the other evaluation material from the class by