

Term Information

Effective Term Autumn 2022

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 2203
Course Title Introduction to Plant Science Laboratory
Transcript Abbreviation IntroPlantSciLab
Course Description Laboratory course designed as an introductory exploration of the world of plant science.
Semester Credit Hours/Units Fixed: 1

Offering Information

Length Of Course 14 Week, 12 Week
Flexibly Scheduled Course Never
Does any section of this course have a distance education component? Yes
Is any section of the course offered 100% at a distance
Grading Basis Letter Grade
Repeatable No
Course Components Laboratory
Grade Roster Component Laboratory
Credit Available by Exam No
Admission Condition Course No
Off Campus Never
Campus of Offering Columbus, Lima, Mansfield, Marion, Newark, Wooster

Prerequisites and Exclusions

Prerequisites/Corequisites prereq or concurrent with 2200
Exclusions
Electronically Enforced Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code 01.1103
Subsidy Level Baccalaureate Course
Intended Rank Freshman, Sophomore, Junior, Senior

Requirement/Elective Designation

Natural Sciences

Course Details

Course goals or learning objectives/outcomes

- Understand the scientific method and how it applies to laboratory experiments.
- Analyze data and the fundamental concepts of successfully growing plants.
- Use critical thinking skills for scientific writing.
- Develop quantitative and analytical skills in data collection.
- Students will be able to search for, organize, synthesize, evaluate and communicate scientific evidence from primary literature.

Content Topic List

- The Scientific Method and Natural Science Literacy
- Plant Origins, Classification & Use
- Plant: Climate Relations
- Plant & Soil Interaction
- Plant Structure, Growth & Development
- Plant Reproduction, Propagation & Genetics
- Mineral Nutrition & Water
- Integration Pest Management (IPM)

Sought Concurrence

No

Attachments

- Distance Approval Cover Sheet_HCS2203.docx: Distance Learning Cover Sheet
(Other Supporting Documentation. Owner: Luikart, Meredith Marie)
- 2200 and 2203 GE Revisions Response.docx: Response to revisions questions
(Other Supporting Documentation. Owner: Luikart, Meredith Marie)
- ClimateLab2022 Example.docx: Lab Example - reponse to revisions questions
(Other Supporting Documentation. Owner: Luikart, Meredith Marie)
- sherrattGE-1-26-22.docx: Revised GE Proposal
(GEC Course Assessment Plan. Owner: Luikart, Meredith Marie)
- HCS 2203 1-26-22.docx: Revised Syllabus
(Syllabus. Owner: Luikart, Meredith Marie)
- Response to revisions Round 2 - HCS 2200_2203 - 1-26-22.docx: Response Round 2
(Other Supporting Documentation. Owner: Luikart, Meredith Marie)

Comments

- See feedback sent to department 12/22/2021 RLS *(by Steele, Rachel Lea on 12/22/2021 01:05 PM)*
- Please see Panel feedback email sent 09/21/2021. *(by Hilty, Michael on 09/21/2021 02:57 PM)*
- Same comment about all campuses *(by Vankeerbergen, Bernadette Chantal on 08/20/2021 03:03 PM)*
- This course, combined with HCS 2200, an existing Natural Sciences GE course with submitted course change request to the new GE, will be a 3 + 1 credit hour Natural Sciences GE. Both courses must be taken to satisfy the Natural Sciences GE requirement.

Revise as per email 15 July 2021 *(by Osborne, Jeanne Marie on 07/27/2021 02:56 PM)*

Workflow Information

| Status | User(s) | Date/Time | Step |
|--------------------|---|---------------------|------------------------|
| Submitted | Luikart, Meredith Marie | 07/09/2021 05:08 PM | Submitted for Approval |
| Approved | Gardner, David Sean | 07/09/2021 10:26 PM | Unit Approval |
| Revision Requested | Osborne, Jeanne Marie | 07/15/2021 03:13 PM | College Approval |
| Submitted | Luikart, Meredith Marie | 07/21/2021 09:57 AM | Submitted for Approval |
| Approved | Gardner, David Sean | 07/21/2021 09:58 AM | Unit Approval |
| Approved | Osborne, Jeanne Marie | 07/27/2021 02:59 PM | College Approval |
| Revision Requested | Vankeerbergen, Bernadette Chantal | 08/20/2021 03:03 PM | ASCCAO Approval |
| Submitted | Luikart, Meredith Marie | 08/23/2021 10:58 AM | Submitted for Approval |
| Approved | Barker, David John | 08/23/2021 11:14 AM | Unit Approval |
| Approved | Osborne, Jeanne Marie | 08/24/2021 02:13 PM | College Approval |
| Revision Requested | Hilty, Michael | 09/21/2021 02:57 PM | ASCCAO Approval |
| Submitted | Luikart, Meredith Marie | 11/30/2021 02:52 PM | Submitted for Approval |
| Approved | Gardner, David Sean | 11/30/2021 02:58 PM | Unit Approval |
| Approved | Osborne, Jeanne Marie | 11/30/2021 04:18 PM | College Approval |
| Revision Requested | Steele, Rachel Lea | 12/22/2021 01:05 PM | ASCCAO Approval |
| Submitted | Luikart, Meredith Marie | 01/27/2022 12:51 PM | Submitted for Approval |
| Approved | Barker, David John | 01/27/2022 01:20 PM | Unit Approval |
| Approved | Osborne, Jeanne Marie | 01/27/2022 01:51 PM | College Approval |
| Pending Approval | Cody, Emily Kathryn Jenkins, Mary Ellen Bigler Hanlin, Deborah Kay Hilty, Michael Vankeerbergen, Bernadette Chantal Steele, Rachel Lea | 01/27/2022 01:51 PM | ASCCAO Approval |

- HCS 2200 approved with one contingency and 6 recommendations:
 - **Contingency – The Panel asks that the GE Proposal document be updated to include the changes that were made to the course syllabus in response to the Panel’s prior feedback. The proposal should function as a stand-alone document that accurately reflects the content of the course. The needed updates include:**
 - **Changing the GE Proposal to reflect the movement of the poster assignments from HCS 2203 to 2200. (GE Proposal pg. 8 under “ELO 1.3”)**

Department response:

The poster assignment was removed completely. Neither course will have this assignment. The proposal has been updated with current lab assignment examples.

- **A revision of the response to how ELO 1.3 will be met (GE Proposal pg. 6-8). This response should include specific examples of the new laboratory experiments and activities that the department outlined in their response to the Panel’s prior feedback**

The proposal has been updated with current lab assignment examples. This includes lab examples that were submitted as part of the feedback from revision round 1.

- *Recommendation: The department’s response to the Panel’s feedback includes the statement that the Digital Plant Collection (formerly Plants of My Life/Plants on Campus) and Aloe Vera assignments have been moved to 2203 from 2200. However, references to these assignments are still present in the in-person syllabus for 2200 (syllabus pgs. 6, 7, 17) even though they have been removed from the online version of the syllabus. The Panel recommends that the in-person syllabus be changed to match the online syllabus and the department’s response to Panel feedback.*

The instructor feels like the Digital Plant Collection is a good fit for the lecture course, HCS 2200. This assignment was removed from the lab syllabus (2203) and added to the lecture. So, this is different from the previous version. The online and in-person assignments have now been updated to match.

- *Recommendation: The online syllabus contains the required statement about how this particular course will meet the Goals and ELOs of the Foundations: Natural Science GE category. However, this statement is missing from the in-person syllabus; in its place is a statement about how the course meets departmental learning objectives. The Panel recommends that the department modify the in-person syllabus to match the online syllabus.*

The statement about how 2200 meets the Goals and ELOs of the Foundations: Natural Science GE has been added to the in-person syllabus and now the online and in-person versions match. The department learning objectives have now been added to online syllabus, to match the in-person syllabus.

- *Recommendation: The Panel recommends that the department modify the Course Change Request (Pg. 3 under “Course goals or learning objectives/outcomes). The goals and ELOs listed here should not be the GE Goals and ELOs, but rather the goals and ELOs of the course.*

The course change request has been updated to remove the GE goals and ELOs.

- *Recommendation: The Panel recommends that the department align points for the “Diversity in Plant Science” assignment. Currently, the Grading and Faculty Response table (online syllabus, pg. 6) says that the assignment is worth 5 points, while the description of the assignment (online syllabus pg. 8) says that it is worth 10 points.*

The points on the assignment table now match the points listed in the descriptions.

- *Recommendation: The Panel recommends that the department consider the mechanics of assuring a variety of responses in the “Diversity in Plant Science” assignment. They encourage the department to consider whether the goal of the assignment is to expose student to a wide variety/large number of plant scientists, or to expose students to plant scientists from traditionally underrepresented populations.*

The instructor has accepted the recommendation of using this “from traditionally underrepresented populations” as part of the assignment description. This is exactly the purpose of this assignment.

- *Recommendation: The Panel recommends that the department reconsider the use of the abbreviation “vs.” in describing the different types of citations that could be used for the Plant Genetics Article Critique (syllabus pg. 9), as they feel this could be confusing to students, and recommend the use of something like “Example 1 and Example 2” as an alternative.*

The instructor has accepted the use of Example 1 and Example 2 for the citation examples and has incorporated that into the syllabus for HCS 2200.

- HCS 2203 approved with two contingencies and one comment:
 - **Contingency – The Panel asks that the GE Proposal document be updated to include the changes that were made to the course syllabus in response to the Panel’s prior feedback. The proposal should function as a stand-alone document that accurately reflects the content of the course. The needed updates include:**
 - **Changing the GE Proposal to reflect the movement of the poster assignments from HCS 2203 to 2200. (GE Proposal pg. 8 under “ELO 1.3”)**

Department Response:

The poster assignment has been removed completely from both courses.

- **A revision of the response to how ELO 1.3 will be met (GE Proposal pg. 6-8). This response should include specific examples of the new**

laboratory experiments and activities that the department outlined in their response to the Panel's prior feedback

The proposal has been updated with current lab assignment examples. This includes lab examples that were submitted as part of the feedback from revision round 1.

- **Contingency – The Panel strongly believes that the workload in this course is appropriate for a 1 credit hour class, however, they ask that the department alter the syllabus language (pg. 3 under “How This Course Works – Credit hours and work expectations”) to coincide with the workload requirement for a 1 credit hour laboratory course that does NOT have 2 consecutive hours of laboratory work. Since this course can be offered in a fully distance format, and 2 *consecutive* hours of lab work per week cannot be guaranteed, the Panel refers the department to Faculty Rule 3335-8-24 (A)(3) and 3335-8-24 (A)(1) found here: https://trustees.osu.edu/bylaws-and-rules/3335-8_**

The department has updated the Credit Hours and Work Expectations section on the HCS 2203 syllabus. This should accurately reflect the work expectations for non-consecutive lab hours.

- **Comment – The Panel notes that both the GE proposal form (pg. 2 under “A. Foundations”, pg. 7 under “ELO 1.3” among others) and the syllabus (pg. 3 under “How This Course Works – Mode of Delivery”,) state that all course materials are free to the student. However, some of the labs require materials (for example, strawberries in 3 different stages of decay) that will need to be procured or purchased by the students. The Panel encourages the department to provide students with a list of what they will need for each module well in advance, so that students can make plans to acquire the needed items, as even “common household items” are not always available to students living in dormitories and other student housing.**

The instructor agrees that adding a cost list for lab materials is a good idea. The instructor added a list for the labs that require additional materials. the estimated cost and a link to a possible item. A sentence was also added that states that if a student has financial hardship and cannot afford supplies to contact the instructor as soon as possible to discuss alternative options.

The Panel requests that 2203 be further expanded upon, as they believe that the course is currently too vague to be able to make a determination about the status of the requested 1 credit hour laboratory status. They struggle to see how this course will give students an opportunity to interact directly with the various plants discussed in 2200.

New lab activities were added to HCS 2203 to address the comment about how various plants introduced in 2200 relate to labs in HCS 2203. Explanation of some lab activities are below where we address point 3 from the panel.

The Panel would like to see further justification about how the course meets the ELOs of the new GE Foundation: Natural Sciences. In its current form, it is not clear how the courses meet the Expected Learning Outcomes of the Foundation.

Further explanation on how the HCS 2200 and HCS 2203 meet the GE Foundation: Natural Sciences can be found on (HCS 2203) pages 2-3, and (HCS 2200 online/in-person) pages 1-2.

The Panel requests further clarification surrounding the data collection and analysis aspects of the laboratory portion of the course, as they currently are unsure what the requirements are and what the data collected is and what it will be used for within the laboratory experiments.

Below are examples of lab activities that will be completed in HCS 2203 and how the data collected will be used.

Lab Example 1: Growing Degree Day

The data collected in this lab activity will encompass Growing Degree Day data, which is available free online and through the CFAES website.

<https://weather.cfaes.osu.edu/>

Students will use that data to predict natural occurrences such as weed and insect emergence, harvesting dates, flowering, and disease probability. For the Autumn semester class, students will record the average air temperature every day for one week and calculate the Growing Degree Day. Using data collected over a week, students can select five natural phenomena (i.e. plants/insects/disease) that would be active during the growing degree day, from the Phenology garden website.

<https://weather.cfaes.osu.edu/gdd/>

For the Spring semester class, students will conduct the same activity in mid-April, due to rising temperatures above 50 degrees.

Analysis: Students will use collected data to create a graph for temperature over time which includes a prediction for the following: Spring semester: crabgrass/weeds emergence and Autumn semester: last date they plant grass seed.

Lab Example 2: Soil Textural Analysis

Students will collect three soil samples from three different areas from around where they live. Using these samples, students will conduct two practical experiments. These experiments will consist of 1. Hand textural analysis to determine soil texture and record data for each soil sample, 2. A soil settlement test, which allows students to immerse soil in a solution and see how the different soil components settle over time. Students will then measure each layer and plot that information on the USA Soil Texture Calculator (free online tool from USDA website).

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_054167

Analysis: Students will compare their hand textural analysis results with the USDA settlement test, to determine soil texture for each sample. This will help students understand if their first assessment was correct.

Lab Example 3: Strawberry DNA

The strawberry DNA activity will demonstrate how DNA can be isolated from a strawberry using common household materials.

<https://www.genome.gov/Pages/Education/Modules/StrawberryExtractionInstructions.pdf>

Students will compare, 3 underripe, 3 ripe, and 3 overripe strawberries to determine how much white material (DNA) is extracted for each. Results will be recorded and plotted on a graph and posted on Carmen to discuss their results with their peers.

Climate Lab Example – see additional documentation: ClimateLab2022 Example

The Panel questions whether the Poster Assignment, found in the 2203 laboratory course, is reflective of a lab activity and would be better suited in the lecture component of the course and asks the Department to consider this or provide a rationale as to how the Poster Assignment addresses the laboratory component, specifically GE Foundation goal 1.3.

The poster assignment was removed and replaced with the digital plant collection. This new activity consists of a photo collection of twenty plants from eight different plant families. Students will collect these plants throughout the course from areas local to them. They will analyze each sample and classify them by family, genus, and species. The collection will also include a short write up description of each species and submitted online. Submission options are available in the syllabus on page 6.

The Panel has questions surrounding the peer interaction within the laboratory component of the course. For example, on page 5 of the syllabus under the Laboratory Assignments & Quizzes section, the syllabus mentions that the objectives are to “report standardized data to me and to your peer group”, “analyze consolidated peer group data”, and “summarize consolidated peer group data”. They would like further clarification around the peer groups, how they function within the scope of the course, and how they are formed, given the asynchronous nature of the course and students will never physically (and possibly virtually) meet one another.

Students will be assigned a group at random in Carmen. Those assignments will be available the first week of class and posted in Carmen. The peer groups will share data from activities such as Growing Degree Day and the Strawberry DNA experiments. These discussions where students compare their results will help students see the importance of experiment replication and peer review of data, which is important for scientific rigor of experiments and results. Students will select a group leader who will post their collective results to the Carmen Discussion forum.

The Panel would like to see details in the syllabus as to how the group work is managed in the weekly schedule; how a group member working early in the week is guided to collaborate with one working much later in the week.

Deadline for each lab is 11:59 on Sundays. Part of the collaborative process is to make sure they have good communication between group members in order to have all lab activity components collected

and submitted to the elected group leader before the due date. The group leader is responsible for communication with the instructor if a group member is not participating. This information is found on page 3 of the syllabus.

The Panel would like to ask the Department to consider whether the Plants of My Life and Aloe Vera assignment would be better suited for the HCS 2203 laboratory course rather than within the current HCS 2200 course.

Horticulture and Crop Science agree with the suggestion to move the Plants of My Life and Aloe Vera assignments to HCS 2203. The Plants of My Life is now the Digital Plant Collection and the Aloe Vera activity is part of the Integrated Pest Management module, lab 8.

The Panel would like to remind the Department that laboratory exercises each week should be the equivalent of two contact hours, or two hours a week. Please see page 18 of the ASC Curriculum and Assessment Services Operations Manual (under Definition of a Semester Credit Hour) for further information here: https://ascas.osu.edu/sites/default/files/2021-09/2021-22_asc_curriculum_and_assessment_operations_manual.pdf

Credit hours and work expectation are outlined on page three of the syllabus. This 1 credit hour course has two hours of work per week which includes lecture, homework, lab activities, readings, etc.

The Panel recommends that the syllabus clearly state how each component of the course functions within the current and new GE program.

HCS 2200 fulfills the requirement for the current Natural Science GE by providing an introduction to the complex interaction of plants, other organisms (including humans), and their environment. Students gain an understanding of the foundations of modern plant science by studying plant production, plant diversity, ecological relationships within and among species, and the evolutionary forces that shape plant form and function. Additional readings and video content reinforce the plant management concepts introduced in lecture, and also explore scientific reasoning and methods. Students enrolled in HCS 2200 learn details of the interrelationship between technology and scientific methods in modern plant science and gain an appreciation of the social and philosophical ramifications of the knowledge of biology through the study of the history of key discoveries in plant science.

To fulfill the new Foundation: Natural Science GE: HCS 2203 in combination with HCS 2200, is a General Education (GE) Foundations: Natural Sciences course. HCS 2203 fulfills Goal 1 in the GE Foundations: Natural Sciences and Expected Learning Outcome 1.3 and HCS 2200 fulfills Goals 1 (learning outcomes 1.1, 1.2) and Goal 2 (learning outcomes 2.1, 2.2., and 2.3). The 1-credit HCS 2203 laboratory is taken in combination with the 3-credit HCS 2200 lecture and together these 4-credits (i.e., 1-credit laboratory + 3-credit lecture) fulfill ALL Goals (i.e., Goals 1 and 2) and ALL Expected Learning Outcomes (i.e., ELOs 1.1, 1.2, 1.3, 2.1, 2.2, 2.3) for the GE Foundations: Natural Sciences category.

SYLLABUS

HCS 2203 INTRODUCTION TO PLANT SCIENCE LABORATORY AUTUMN 2022 ONLINE

COURSE OVERVIEW

Instructor

Instructor: Pamela Sherratt

Email (preferred method of communication): sherratt.1@osu.edu

Phone/text number: 614-292-7457

Office location: 240C Howlett Hall

Office hours: By appointment through Zoom, Skype, or other videoconferencing tools. Contact instructor to set up a meeting and choose which tool to use.

Course Organization

Credits: 1

Prerequisites (or concurrent): HCS 2200 The World of Plants

HCS 2203 is an asynchronous virtual laboratory (100% online) that fulfills 1-credit of the General Education (GE) Category: GE Foundations: Natural Sciences. It is intended to be taken with the 3-credit GE Foundations: Natural Sciences course titled “The World of Plants” Lecture (HCS 2200). Together the HCS 2200 lecture (3 credits) and HCS 2203 laboratory (1 credit) fulfill 4-credits of the General Education (GE) Category: GE Foundations: Natural Sciences.

HCS 2203 will utilize multiple online platforms supported by Ohio State. All content, including labs, slides, demonstrations, presentations, notes, videos, readings will be delivered through Carmen (<https://carmen.osu.edu>) or Ohio State Libraries (<https://library.osu.edu/>). Students will have free access to all course content for the entire semester.

HCS 2203 is asynchronous and self-paced to give students the ability to access and satisfy requirements within a flexible time frame. Labs are broken down into weekly activities and assignments and students are given 1 week to complete each assignment. All assignments are open book. However, all course requirements must be

completed independently by the enrolled student. All assignments, activities, quizzes, and exams must be completed using Carmen.

Students will be assigned a group at random in Carmen. Those assignments will be available the first week of class and posted in Carmen. The peer groups will share data from activities such as Growing Degree Day and the Strawberry DNA experiments. These discussions where students compare their results will help students see the importance of experiment replication and peer review of data, which is important for scientific rigor of experiments and results. Students will select a group leader who will post their collective results to the Carmen Discussion forum.

Deadline for each lab is 11:59 on Sundays. Part of the collaborative process is to make sure they have good communication between group members in order to have all lab activity components collected and submitted to the elected group leader before the due date. The group leader is responsible for communication with the instructor if a group member is not participating.

Course description

Laboratory course designed as an introductory exploration of the world of plant science.

HCS 2203 fulfills 1-credit of the General Education (GE) Category: GE Foundations: Natural Sciences. Students will engage in theoretical and empirical study within the natural sciences. Students will gain an appreciation of modern principles, theories, methods, and modes of inquiry used generally across the natural sciences. Students will discern the relationship between science and technology, while appreciating the implications of scientific discoveries and the potential impacts of science and technology to address problems of the contemporary world.

HOW HCS 2203 FULFILLS THESE GE NATURAL SCIENCE GOALS AND LEARNING OUTCOMES

This course, in combination with HCS 2200, is a General Education (GE) Foundations: Natural Sciences course. HCS 2203 fulfills Goal 1 in the GE Foundations: Natural Sciences and Expected Learning Outcome 1.3.

When this 1-credit HCS 2203 laboratory is taken in combination with the 3-credit HCS 2200 lecture and together these 4-credits (i.e., 1-credit laboratory + 3-credit lecture) fulfill ALL Goals (i.e., Goals 1 and 2) and ALL Expected Learning Outcomes (i.e., ELOs 1.1, 1.2, 1.3, 2.1, 2.2, 2.3) for the GE Foundations: Natural Sciences category.

HCS 2203 GE NATURAL SCIENCES GOAL 1 AND LEARNING OUTCOME

GOAL 1: Successful students will engage in theoretical and empirical study within the natural sciences, while gaining an appreciation of the modern principles, theories, methods, and modes of inquiry used generally across the natural sciences.

- Expected Learning Outcome 1.3: Successful students are able to employ the process of science through exploration, discovery, and collaboration to interact directly with the natural world when feasible, using appropriate tools, models, and analysis of data.

This course fulfills goal 1, learning outcome 1.3 of the foundations natural science GE through a variety of lab activities such as the digital plant collection, soils and plant physiology practicums, growing degree day (GDD) data analysis, and using models to calculate fertilizer requirements and other plant needs. Students will interact directly with plants during the propagation lab and the plants parts treasure hunt, as well as their digital plant collection.

Course Goals

1. Understand the scientific method and how it applies to laboratory experiments.
2. Analyze data and the fundamental concepts of successfully growing plants.
3. Use critical thinking skills for scientific writing.
4. Develop quantitative and analytical skills in data collection.
5. Students will be able to search for, organize, synthesize, evaluate and communicate scientific evidence from primary literature.

How the course learning objectives address departmental learning objectives: HCS 2203 integrates fundamentals of physical and biological sciences in the context of sustainable plant systems (Dept. Objective 2), introduces concepts in translational plant science (Dept. Objective 3), introduces students to the ecological basis of sustainability and sustainable practices (Dept. Objective 4), and instills an appreciation for the necessity of life-long learning and using evaluation and synthesizing skills (Dept. Objective 7).

HOW THIS COURSE WORKS

Mode of delivery: HCS 2203 is a 100% asynchronous online laboratory taught through Carmen (<https://carmen.osu.edu>). There are no sessions that require you to be logged into Carmen at a scheduled time. All course materials (i.e., journal articles, newspaper articles, book chapters, database access) will be free with no cost to the student.

Pace of online activities: This laboratory is divided into weekly assignments and activities. Students will complete those assignments and activities each week. Students are expected to keep pace with weekly deadlines but may schedule their efforts freely within each week.

Group work: Students will be assigned a group at random in Carmen. Those assignments will be available the first week of class and posted in Carmen. Students will elect a group leader.

Part of the collaborative process is to make sure they have good communication between group members in order to have all lab activity components collected and submitted to the elected group leader before the due date. The group leader is responsible for communication with the instructor if a group member is not participating.

Credit hours and work expectations: This is a 1-credit-hour laboratory. According to [Ohio State policy](#), students should expect to spend 3 hours per week to earn the average grade of “C” in this laboratory. A student’s 3-hour-workweek includes direct instruction, taking notes, studying, readings, assignments, quizzes and exams.

Attendance and participation requirements: Because this is an online laboratory, your attendance is based on your online activity and participation. You are expected to log in to Carmen every week. During most weeks you will likely log in multiple times to complete your work. If you have a situation that might cause you to miss an entire week, please email the instructor (sherratt.1@osu.edu) to discuss adjusted timelines.

COURSE MATERIALS AND TECHNOLOGIES

Textbook

REQUIRED

- Lab Manual provided by the instructor through Carmen

Lab Equipment

REQUIRED

Students may use these examples or anything similar.

Soil Textural Analysis experiment: Mason jar or any similar jar with a lid.

Example Cost: Mason Jar with lid from Walmart \$2.32

https://www.walmart.com/ip/Ball-Glass-Mason-Jar-with-Lid-Band-Wide-Mouth-32-oz-1-Count/24653886?wmlspartner=wlp&selectedSellerId=0&wl13=2098&&adid=2222222227017575253&wl0=&wl1=g&wl2=c&wl3=537189085143&wl4=pla-381295077030&wl5=9014969&wl6=&wl7=&wl8=&wl9=pla&wl10=8175035&wl11=local&wl12=24653886&veh=sem&qclid=Cj0KCCQIA_8OPBhDtARIsAKQu0gZNF0kIIF7WhLsfnl5a_knCIPU_Cg-Jy8XW1p0dBSNiAwHILv8DFQYAnahEALw_wcB&qclsrc=aw.ds

Photosynthesis experiment: Celery and food dye

Example Cost: Celery \$1.89

https://www.target.com/p/organic-celery-each/-/A-15407758?ref=tgt_adv_XS000000&AFID=google_pla_df&fndsrc=tgtao&DFA=71700000012732781&CPNG=PLA_Grocery%2BShopping_Local%7CGrocery_Ecomm_Food_Bev&adgroup=SC_Grocery&LID=700000001170770pgs&LNM=PRODUCT_GROUP&network=g&device=c&location=9014969&targetid=aud-554348709499:pla-332457914846&ds_rl=1246978&ds_rl=1248099&qclid=Cj0KCCQIA_8OPBhDtARIsAKQu0gYNjsXXfaZH7bP-dgqfkygcpm78Wrrt1xUrPLkBMODMkn_G8Q2QlaAsV_EALw_wcB&qclsrc=aw.ds

Example Cost: Food dye \$3.69

<https://www.target.com/p/mccormick-4ct-assorted-food-color-and-egg-dye-1oz/-/A-13353207#lnk=sametab>

Extracting DNA from strawberries experiment:

Example Costs:

Isopropyl alcohol (5 mL): \$2.69

<https://www.target.com/p/isopropyl-70-alcohol-antiseptic-32oz-up-38-up-8482/-/A-11454824#ink=sametab>

Dish soap (10 mL): \$0.99

<https://www.target.com/p/dawn-ultra-dishwashing-liquid-dish-soap-original-scent-7-fl-oz/-/A-75666580#ink=sametab>

Salt (1/4 tsp): \$0.55

<https://www.target.com/p/iodized-salt-26oz-good-38-gather-8482/-/A-78140513#ink=sametab>

Quart size Zipper-lock bag: \$5.99

<https://www.target.com/p/zipper-storage-bags-up-up/-/A-82489847?preselect=14730756#ink=sametab>

Strainer/colander: Any strainer/colander will be fine. Here's an example of a cheap one: \$2.99

<https://www.target.com/p/goodcook-ready-3qt-colander/-/A-82399867#ink=sametab>

Water (90 mL) – water bottle, kitchen or bathroom sink is fine.

Measuring cups and spoons: Here is a set from Target. Any measuring cup and spoon set is fine.

<https://www.target.com/p/measuring-cups-and-spoons-made-by-design-8482/-/A-53142231#ink=sametab>

If you have financial hardship and can not afford the lab supplies, please contact the instructor as soon as possible for alternative options.

OPTIONAL

- Plant Science: Growth, Development, and Utilization of Cultivated Plants 6th Edition (2019), Margaret McMahon

Course technology

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** <http://ocio.osu.edu/selfservice>
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu

- TDD: 614-688-8743

BASELINE TECHNICAL SKILLS FOR ONLINE COURSES

- Basic computer and web-browsing skills
- Basic skills with Microsoft Word, Excel and PowerPoint
- Navigating Carmen: for questions about specific functionality, see the [Canvas Student Guide](#).

REQUIRED EQUIPMENT

- Computer: current Mac (OS X) or PC (Windows 7+) with high-speed internet connection
- Microphone: built-in laptop or tablet mic or external microphone
- (Recommended) Webcam: built-in or external webcam, fully installed and tested
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

REQUIRED SOFTWARE

- [Microsoft Office 365](#): All Ohio State students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Full instructions for downloading and installation can be found at go.osu.edu/office365help.

CARMEN ACCESS

You will need to use [BuckeyePass](#) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, it is recommended that you take the following steps:

- Register multiple devices in case something happens to your primary device. Visit the [BuckeyePass - Adding a Device](#) help article for step-by-step instructions.
- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click "Enter a Passcode" and then click the "Text me new codes" button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the [Duo Mobile application](#) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service.

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357 (HELP) and the IT support staff will work out a solution with you.

If you experience connection problems with Carmen then the very first thing that you should try is another web browser such as Firefox, Explorer, Chrome, and Safari. If you are having difficulty opening a document or viewing an image or any other issue associated with this class, then it is most likely a problem with your computer, Internet connection or Internet browser. While everything for this class has been thoroughly tested, if you experience a mistake, please let us know so that we can correct it.

GRADING AND FACULTY RESPONSE

How your grade is calculated

| ASSIGNMENT CATEGORY | PERCENTAGE |
|--------------------------------------|------------------|
| 15 Weekly Participation Activities | 50% (3.3% each) |
| 8 Laboratory Assignments and Quizzes | 50% (6.25% each) |
| Total | 100% |

**See course schedule for due dates. Everything due by 11:59PM on Sundays.*

Weekly Participation Activities (15, 2% each, 30% total): You will complete a total of 15 weekly participation assignments during the semester (1 activity per week), all of which will be submitted on Carmen and due on Sundays at 11:59PM. Each assignment will be unique and worth 2% of your Final Grade for the course. A student who demonstrates good faith effort on all aspects of the weekly participation activity and demonstrated engagement in the activity will receive full credit.

Objectives of participation activities:

1. Communicate experimental results to lab group and reflect on the experimental process.
2. Further investigate lab concepts through independent research and data analysis.
3. Build community and maintain communication with peers.

For each weekly participation activity, you will be required to complete a small 15–20 minute task (e.g., graph data, construct a scientific table, analyze and interpret data, report results) that will be paired with topics discussed in weekly modules.

Academic Integrity Policy: These participation activities are open-book, however, you must complete the work on your own without help from peers. Student are encouraged to communicate their findings with the peers in their lab group, but no one else should revise or rewrite your work.

Laboratory Assignments & Quizzes (8, 6.25% each, 50% total): You will complete a total of 8 laboratory assignments over 8 labs this semester, all of which will be submitted on Carmen and due on Sundays at 11:59PM. Each lab will be conducted over two weeks and comprise of two related laboratory assignments. For example, Lab Assignment 1 will pertain to the first lab on the Scientific Method (see course schedule below). Within the first lab assignment, you will collect and report data. Within the second lab assignment you will summarize and analyze class data collected in the first lab assignment. Each assignment will be unique and worth 10% of your Final Grade for the course. Assignments will be available on Carmen for 7 days to accommodate all students. Readings, data sets, and instructional videos that are required for laboratory assignments will all be free and provided through Carmen.

Objectives of laboratory assignments:

1. Describe common instruments, equipment, techniques and methods used by scientists to collect data. Learn about protocols, operation, benefits and limitations of each.
2. Use described methods to collect data and report standardized data to me and to your peer group.
3. Analyze consolidated peer group data through calculations (i.e., mean, p-value, standard deviation).
4. Summarize consolidated peer group data through visualizations (i.e., graphs, charts, tables).

Each laboratory assignment will consist of two parts and you will be required to:

Part 1 - Learn about the lab procedure and how scientists have used the technique or methods in the peer-reviewed literature. Execute the experiment and report standardized data to me and to your peer group on Carmen (see weekly participation activities). Create, analyze and interpret graphs and tables using Microsoft Word and Microsoft Excel.

Part 2 - Answer short-answer, multiple choice, matching pairs and T/F quiz questions. These quiz questions will be based on the data that you collect and analyze, and experiments that you conduct on your own at home. Some questions will require you to complete calculations, plot data, analyze tables, and describe procedures and experimental approaches.

Academic Integrity Policy: These participation activities are open-book and many of the activities will be carried out in conjunction with a lab peer group. Students are encouraged to collaborate with their peers on laboratory assignments (Part 1). Quizzes (Part 2) are timed and open-book. You must complete the quizzes on your own, without help from peers.

COURSE SCHEDULE

Refer to the Carmen Canvas course for up-to-date due dates

| Week | 8 Lab Assignments** | 8 Quizzes | 15 Weekly Activities* |
|------|---|-----------|--|
| 1 | Lab 1: The Scientific Method and Natural Science Literacy | Quiz 1 | Worksheet: Citing sources and data analysis |
| 2 | Lab 2: Plant Origins, Classification & Use | | Taxonomy Assignment |
| 3 | | Quiz 2 | Phytochemical Discussion |
| 4 | Lab 3: Plant: Climate Relations | | Worksheet: USDA Hardiness zones & climate change |
| 5 | | Quiz 3 | Growing Degree Day (GDD) data set analysis |
| 6 | Lab 4: Plant & Soil Interaction | | USDA Soil Survey mapping |
| 7 | | Quiz 4 | Worksheet: Soil Textural Analysis experiment |
| 8 | Lab 5: Plant Structure, Growth & Dev. | | Worksheet: Transpiration & photosynthesis experiments |
| 9 | | Quiz 5 | Plant Parts treasure hunt and propagation |
| 10 | Lab 6: Plant Reprod., Prop. & Genetics. | Quiz 6 | Worksheet: Extracting DNA from strawberries experiment |
| 11 | | | Plant propagation – Aloe Vera |
| 12 | Lab 7: Mineral Nutrition & Water | Quiz 7 | Planimeter mapping math worksheet, and C:N ratios |
| 13 | Lab 8: Integrated Pest Management (IPM) | | Worksheet: Pesticide product labels |
| 14 | | Quiz 8 | Diagnostic Branching Activity – why did my plant die? |
| 15 | Wrap Up/virtual office hours | | |

*Weekly activities will be due midnight each Sunday.

**Lab assignments & quizzes will be due at the end of the lab activity period

Late policy

Assignments will be submitted on Carmen within a flexible time frame of 1 week. These can be completed at any time within the 1-week submission window. Students will be permitted to work 1-week ahead if they choose to do so. Submission after the due date for assignments will result in a **10% deduction per day from the overall grade. The submission window will automatically close after 10 days from the due date and will not reopen.** Submissions that are sent by email will not be accepted. All assignments must be submitted on Carmen.

Extenuating circumstances sometimes occur. Students who miss an assessment due to a legitimate reason (e.g., emergency, hospital visit, extended illness) should contact their instructor to request permission to make-up an assignment. The instructor will determine if an excuse is acceptable. If approved, the student will not be penalized -10% per day. If approved, the student must make up the missed assessment within a time frame specified by the instructor. Since this course has flexible due dates with assignments open for a period of days to weeks on [Carmen](#), acceptable excuses typically entail lengthy illness, extended hospitalization or other serious issues with official documentation.

The due date for each assignment is provided on Carmen on the very first day of the semester to help students plan their semester. It is the responsibility of the student to know the due date for all assignments. We do this to accommodate students' busy schedules. Students are expected to plan their semester accordingly. Technical glitches such as a bad internet connection, faulty internet browser, a computer that "crashes", a battery that runs out of power, an obnoxious roommate, software malfunction, a flat tire, etc. are not acceptable excuses for missing a deadline. The instructor does not accept assignments by e-mail, and these will be deleted and not graded. Assignments should always be completed and/or submitted using [Carmen](#).

Grading scale

| Letter Grade | % | Mastery |
|--------------|-------------|--|
| A | 93.00–100.0 | Demonstrates complete mastery of all learning outcomes as demonstrated on assessments; participates in all aspects of the lab in a positive and timely manner. |
| A- | 90.00–92.99 | |
| B+ | 87.00–89.99 | Demonstrates mastery of at least two learning outcomes as demonstrated on assessments; participates in all aspects of the lab in a positive and timely manner. |
| B | 83.00–86.99 | |
| B- | 80.00–82.99 | |
| C+ | 77.00–79.99 | Demonstrates mastery of at least one learning outcome as demonstrated on assessments; participates in some aspects of the lab in a positive and timely manner. A minimum grade of “C-” will be earned by a student making a good faith effort on all aspects of the lab and demonstrated engagement. |
| C | 73.00–76.99 | |
| C- | 70.00–72.99 | |
| D+ | 67.00–69.99 | Fails to meet mastery of any learning outcome such that student will not be successful in higher-level course; did not complete assessments; demonstrated lack of engagement, did not participate in lab, did not complete assessment in a timely fashion. |
| D | 60.00–66.99 | |
| E | 00.00–59.99 | |

Instructor feedback and response time

I am providing the following list to give you an idea of my intended availability throughout the course. Remember that you can call [614-688-4357 \(HELP\)](tel:614-688-4357) at any time if you have a technical problem.

- **Preferred contact method:** The instructor will check and reply to emails daily. Please email sherratt.1@osu.edu as this is the email dedicated to the course. Please use your OSU email account to send emails to this account. We will reply to emails within **24 hours on days when class is in session at the university**.
- **Class announcements:** All important class-wide messages will be sent through the Announcements tool in CarmenCanvas. Please check [your notification preferences](http://go.osu.edu/canvas-notifications) (go.osu.edu/canvas-notifications) to ensure you receive these messages.
- **Discussion board:** I will check and reply to messages in the discussion boards once mid-week and once at the end of the week.
- **Grading and feedback:** For assignments, you can expect a grade and feedback within **7-10 days**. Assignments submitted after the due date may have reduced feedback and grades may take longer to be posted.

Communication Guidelines

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics. Beware not all students perceive color in the same way. When you use **color** also use **Bold**, *Italicize* or Underline as emphasis. A good practice is to use the Accessibility Checker in all Microsoft Office 365 products available to all students.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online. I will provide specific guidance for discussions on controversial or personal topics.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

EMAIL ETIQUETTE

Professional relationships should be maintained when using e-mail for a class. Below I have included guidelines from Bloomsbury's guide on email etiquette that you should follow when drafting your e-mail.

DO

- Include a descriptive statement in the subject line.
- Use proper salutations when beginning an e-mail. For example: Dear/Hello Prof Buckeye,
- Be concise in the body of the e-mail, use complete sentences and proper grammar.
- Use an appropriate closure at the end of each e-mail followed by your first and last name. For example: Sincerely/Thank you, Brutus Buckeye.
- If replying to an e-mail, reference the original e-mail and its content.
- Be selective of your choice of words. Emotions are difficult to convey in text and without the benefit of facial expressions your sentiment can be lost in the words you choose to write.

DON'T

- Use all capital letters; this conveys a tone of ANGER.
- Use e-mail as a format to criticize other individuals.

- Ask for your grade via e-mail. Grades will not be discussed by e-mail. If you need to discuss a graded item make an appointment to do so during office hours.
- E-mail to inquire when grades will be posted. We will work toward submitting grades promptly, however, recognize that grading assignments and exams requires considerable time to ensure uniformity and fairness. I will typically post an Announcement when large grades are released.
- Send an e-mail out of frustration or anger. Learn to save the e-mail as a draft and review later when emotions are not directing the content.

Fair assessment practices

We understand that grades are important to our students and we strive to have clearly stated learning outcomes. We work hard to ensure that student grades are calculated in a fair and accurate manner. Things that we do to ensure that the assessments we administer are fair and accurate:

1. We use grading rubrics to score all laboratory and poster assignments. These rubrics provide clear grading expectations for varying levels of mastery. Students are able to see a grading rubric before they start working on an assignment so that performance expectations are clearly understood.
2. We evaluate the outcomes of assignments by checking all questions and all answers after an assignment closes to check for mistakes. Typically, we want to see that each question was answered correctly approximately 80% of the time. This 80% threshold indicates that a question was a fair assessment of the course material. If this threshold is not met, we do not count the question or we provide students with another opportunity to answer a new question.
3. We encourage students to do well on assessments by making all assignments open-book and allowing students to complete all assignments from anywhere.
4. We encourage students to do well on assessments by providing students an extended period of time (e.g., 7 days) to complete assignments.
5. We accept late assignments with a small penalty of -10% deduction per day late. This ensures that a student would not receive an automatic grade of 0% for missing an assignment.
6. We provide clearly stated learning outcomes for our modules that are aligned to course content and assessments so that students better understand why they are completing an activity.

If you have questions about these practices or how your grade is calculated throughout the semester, please contact your instructor at sherratt.1@osu.edu

OTHER COURSE POLICIES

Academic integrity policy

POLICIES FOR THIS ONLINE COURSE

- **Assignments:** Your written assignments, including discussion posts, should be your own original work. In formal assignments, you should follow the provided course style to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in—but no one else should revise or rewrite your work. For the poster assignment, we will use Turn-In-In software to check for plagiarism. Students will not receive credit for plagiarized work.
- **Reusing past work:** In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me at sherratt.1@osu.edu.

OHIO STATE'S ACADEMIC INTEGRITY POLICY

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's [Code of Student Conduct](#), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the University's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University's *Code of Student Conduct* is never considered an excuse for academic misconduct, so I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If the instructor suspects that a student has committed academic misconduct in this lab, the instructor is obligated by University Rules to report suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University.

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- The Committee on Academic Misconduct web pages ([COAM Home](#))
- *Ten Suggestions for Preserving Academic Integrity* ([Ten Suggestions](#))
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Grievances

According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, take your case to the department chairperson, college dean or associate dean, and to the provost, in that order. Specific procedures are outlined in Faculty Rule 3335-7-23. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department. Contacts for The School of Environment and Natural Resources can be found here: <https://senr.osu.edu/our-people>

Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course. Under [The Ohio State University's Intellectual Property Policy](#), faculty retain copyright in their creative and scholarly works. Students also hold the copyright in their own creative and scholarly works. The requirement to provide a copy of a paper or project created as an assignment for class does not mean that the student has surrendered their copyright.

For more information see: <https://library.osu.edu/copyright/basics>

Academic support services

The Ohio State University offers a variety of free services to aid students in their academic success. Below I have listed several that may be of use in this course. Additional academic support may be available through individual academic departments. Please [consult your academic advisor](#) or your program's website for more information.

- [Walter E. Dennis Learning Center](#) - provides academic workshops and courses designed to help students be more successful in their academics. Learning Specialists are available to meet with students individually to discuss topics like time management, study skills, test anxiety, etc.
- [Younkin Success Center](#) - houses a variety of services and resources for students including a computer lab and 24-hour study space during finals week. Also offered are tutoring, academic services, career services, and wellness services.
- [Center for the Study and Teaching of Writing](#) - assists students in writing research papers, lab reports, resumes, etc.
- [University Libraries](#) - provides over 20 libraries on campus, online resources, nationwide databases, etc.

Your mental health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may

lead to diminished academic performance or reduce a student's ability to participate in daily activities. No matter where you are engaged in distance learning, The Ohio State University's Student Life Counseling and Consultation Service (CCS) is here to support you. If you find yourself feeling isolated, anxious or overwhelmed, [on-demand mental health resources](https://go.osu.edu/ccsondemand) (go.osu.edu/ccsondemand) are available. You can reach an on-call counselor when CCS is closed at [614- 292-5766](tel:614-292-5766). **24-hour emergency help** is available through the [National Suicide Prevention Lifeline website](https://suicidepreventionlifeline.org) (suicidepreventionlifeline.org) or by calling [1-800-273-8255\(TALK\)](tel:1-800-273-8255). [The Ohio State Wellness app](https://go.osu.edu/wellnessapp) (go.osu.edu/wellnessapp) is also a great resource.

David Wirt, wirt.9@osu.edu, is the CFAES embedded mental health counselor. He is available for new consultations and to establish routine care. To schedule with David, please call 614-292-5766. Students should mention their affiliation with CFAES when setting up a phone screening.

Creating an Environment Free from Harassment, Discrimination, and Sexual Misconduct

The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:

- Online reporting form at equity.osu.edu,
- Call 614-247-5838 or TTY 614-688-8605,
- Or Email equity@osu.edu

The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:

- All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
- The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware

of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member."

This course adheres to The Principles of Community adopted by the College of Food, Agricultural, and Environment Sciences. These principles are located on the Carmen site for this course, and can also be found at <https://go.osu.edu/principlesofcommunity>. For additional information on Diversity, Equity, and Inclusion in CFAES, contact the CFAES Office for Diversity, Equity, and Inclusion (<https://equityandinclusion.cfaes.ohio-state.edu/>). If you have been a victim of or a witness to a bias incident, you can report it online and anonymously (if you choose) at <https://studentlife.osu.edu/bias/report-a-bias-incident.aspx>.

ACCESSIBILITY ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

Requesting accommodations

The university strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability including mental health, chronic or temporary medical conditions, please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with [Student Life Disability Services \(SLDS\)](#). After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

DISABILITY SERVICES CONTACT INFORMATION

- Phone: [614-292-3307](tel:614-292-3307)
- Website: slds.osu.edu
- Email: slds@osu.edu
- In person: [Baker Hall 098, 113 W. 12th Avenue](#)

Accessibility of course technology

This course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations as early as possible.

- [CarmenCanvas accessibility](https://go.osu.edu/canvas-accessibility) (go.osu.edu/canvas-accessibility)

- Streaming audio and video
- [CarmenZoom accessibility](https://go.osu.edu/zoom-accessibility) (go.osu.edu/zoom-accessibility)
- [Microsoft 365 accessibility](#)
- [Turnitin accessibility](#)

ACCESSIBILITY PRACTICES IN THIS COURSE

Several accessibility accommodations are already built into our course for all students (see list below). We work to provide these accommodations to all students and want to make sure all students have a positive learning experience in our course. Please send documentation from SLDS to sherratt.1@osu.edu in order to establish any further accommodations needed during the semester.

1. **Extended Time (1.5x or 2x) Assignments: SLDS-REGISTERED STUDENTS SHOULD EMAIL THEIR PLAN.** A student must send their completed SLDS paperwork to the instructor at sherratt.1@osu.edu. Once accommodations are verified, we will setup all assessments accordingly.
2. **Note Taking Assistance/Recording: PROVIDED TO ALL STUDENTS.** We provide all lab presentation slides via Carmen. Fully typed transcripts for lab presentations are provided via YouTube. Students can copy/paste the entire typed transcript anytime using any word processing software (e.g., Microsoft Word) directly from YouTube for all videos. These transcripts serve as written notes for all lectures.
3. **Closed-captioning and transcripts: PROVIDED TO ALL STUDENTS.** All required multimedia (e.g., videos, podcasts) are accompanied with closed captioning or transcripts that meet ADA requirements. Most times these features are provided by the content producer (e.g., The New York Times, PBS, NPR, Nature, National Geographic). However, you may find select transcripts produced by the course team and linked in Carmen.
4. **Flexible due dates for assignments: PROVIDED TO ALL STUDENTS.** All assignments are open on Carmen for a period of at least 7 days to accommodate students' busy schedules. Students can complete these assignments anytime while the window is open. Extenuating circumstances sometimes occur. Students who miss a due date for a legitimate reason (e.g., emergency, hospital visit, extended illness, unforeseen health issue, homelessness) should contact the instructor before the due date by email (sherratt.1@osu.edu) to request additional time. The instructor will determine if an excuse is acceptable.

Laboratory Example

Laboratory Assignments & Quizzes General Information (8, 6.25% each, 50% total): You will complete a total of 8 laboratory assignments over 8 labs this semester, all of which will be submitted on Carmen and due on Sundays at 11:59PM. Each lab will be conducted over two weeks and comprise of two related laboratory assignments. For example, Lab Assignment 1 will pertain to the first lab on the Scientific Method (see course schedule below). Within the first lab assignment, you will collect and report data. Within the second lab assignment you will summarize and analyze class data collected in the first lab assignment. Each assignment will be unique and worth 10% of your Final Grade for the course. Assignments will be available on Carmen for 7 days to accommodate all students. Readings, data sets, and instructional videos that are required for laboratory assignments will all be free and provided through Carmen.

Objectives of laboratory assignments:

1. Describe common instruments, equipment, techniques and methods used by scientists to collect data. Learn about protocols, operation, benefits and limitations of each.
2. Use described methods to collect data and report standardized data to me and to your peer group.
3. Analyze consolidated peer group data through calculations (i.e., mean, p-value, standard deviation).
4. Summarize consolidated peer group data through visualizations (i.e., graphs, charts, tables).

Each laboratory assignment will consist of two parts and you will be required to:

Part 1 - Learn about the lab procedure and how scientists have used the technique or methods in the peer-reviewed literature. Execute the experiment and report standardized data to me and to your peer group on Carmen (see weekly participation activities). Create, analyze and interpret graphs and tables using Microsoft Word and Microsoft Excel.

Part 2 - Answer short-answer, multiple choice, matching pairs and T/F quiz questions. These quiz questions will be based on the data that you collect and analyze, and experiments that you conduct on your own at home. Some questions will require you to complete calculations, plot data, analyze tables, and describe procedures and experimental approaches.

Academic Integrity Policy: These participation activities are open-book and many of the activities will be carried out in conjunction with a lab peer group. Students are encouraged to collaborate with their peers on laboratory assignments (Part 1). Quizzes (Part 2) are timed and open-book. You must complete the quizzes on your own, without help from peers.

Lab 3 - Climate Lab

Objectives:

1. to study the effect of temperature on plant and insect development
2. to study the effects of temperature and rainfall on plants
3. to study the role of controlled environment in greenhouse plant production systems

Definitions:

Abiotic factors: are the non-living factors of the environment that can often have a major influence on living organisms. Abiotic factors include water, sunlight, oxygen, soil, rainfall, and temperature.

Biotic factors: are all of the living things in an ecosystem, such as plants, animals, and soil microbes. These living things interact with one another in many ways.

Growing degree days: The measurement of heat accumulation used to predict crop maturation and other phenological events such as stages in an insect life cycle.

$$GDD = \sum_{i=s}^n (T_d - base)$$

Where GDD = Growing Degree Days

s = the day/date on which to start measurements (usually Jan 1)

n = the day/date on which to end measurements

T_d = the average temperature for each day of observation

Base = base temperature for the crop in question (usually 50F)

Greenhouses: Greenhouses are structures with transparent roofing and walls, are designed for plant cultivation under controlled environmental conditions. Greenhouses allow for greater control over growing environment of plants. Plants can be grown in greenhouses throughout the year. Greenhouses are becoming increasingly important for growing flowers, vegetables, fruits, and transplants.

The most important environmental parameters that need to be controlled for optimum greenhouse environment are temperature, relative humidity, and CO₂.



Howlett Greenhouses

Climate: conditions such as wind, precipitation, and temperature that prevail in a given region.

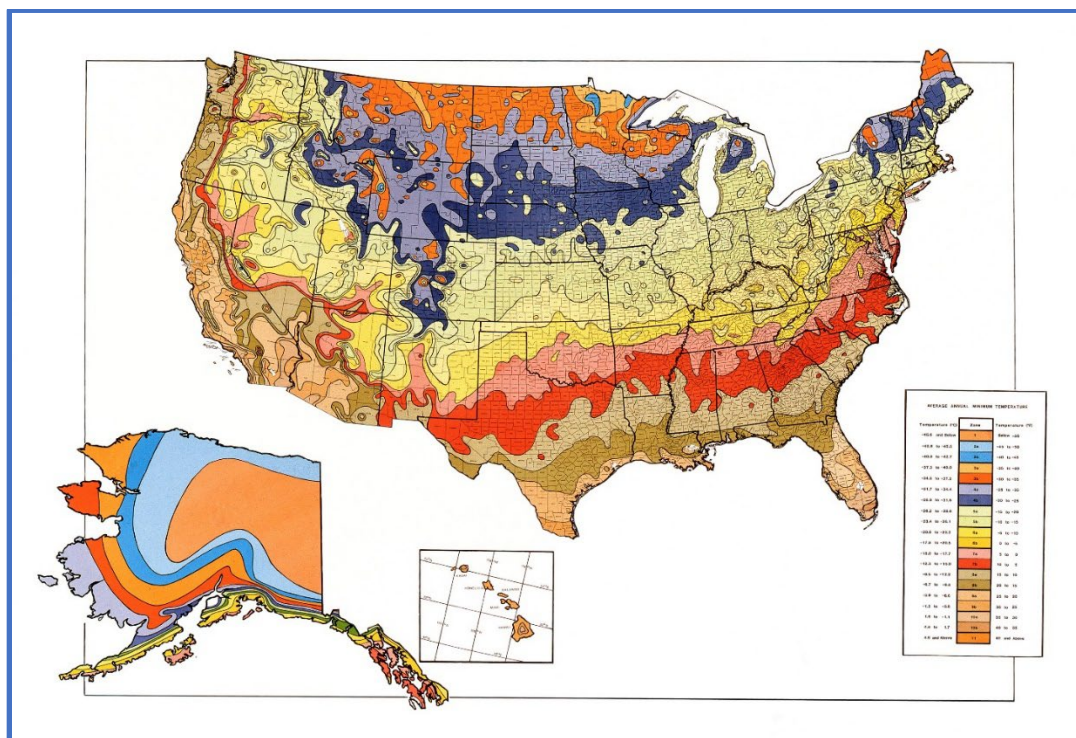
Weather: The current conditions of temperature, wind, precipitation, etc. in an area.

Plant hardiness Zone Map: The accurate prediction of winter injury caused by low-temperature events is a key component of the effective cultivation of woody and herbaceous perennial plants. A common method employed to visualize geographic patterns in the severity of low-temperature events is to map a climatological variable that closely correlates with plant survival. The U.S. Department of Agriculture Plant Hardiness Zone Map (PHZM) is created for that purpose. The new PHZM is based on extreme minimum-temperature data logged annually from 1976 to 2005 at 7983 weather stations in the United States, Puerto Rico, and adjacent regions in Canada and Mexico. The PHZM is accessible via an interactive website, which facilitates a wide range of horticultural applications. In addition, the new map includes a zip code finder, and it could be used by governmental agencies for risk management and development of recommended plant lists, by horticultural firms to schedule plant shipments, and by other commercial interests that market products seasonally (Source: Mark et al., 2012).

The new color coded USDA PHZM map is available online, interactive, and downloadable. In addition, the map is also used to set national crop insurance standards and predict locations at risk for weeds and troublesome invasive plants that can cause large economic and ecological impacts. The map divides the U.S. into 26 zones — each in a 5-degree Fahrenheit temperature range — to reflect growing conditions. Plant hardiness zones are based on the annual extreme minimum temperature in a location over a particular period of time. The colder the winters, the lower the zone...

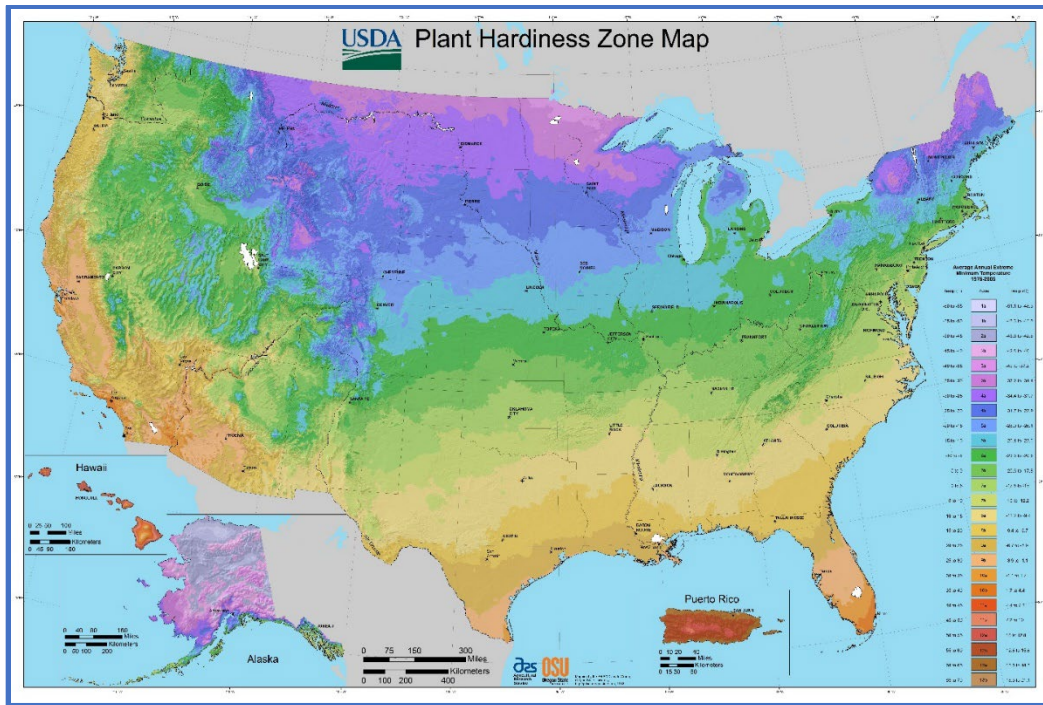
(<http://planthardiness.ars.usda.gov/PHZMWeb/>;

<http://planthardiness.ars.usda.gov/phzmweb/interactivemap.aspx>).



1990 US Plant Hardiness Zone Map

(Source: <http://planthardiness.ars.usda.gov/phzmweb/Downloads.aspx>)



2012 US Plant Hardiness Zone Map

(Source: <http://planthardiness.ars.usda.gov/phzmweb/Downloads.aspx>)

What's new (source: USDA)

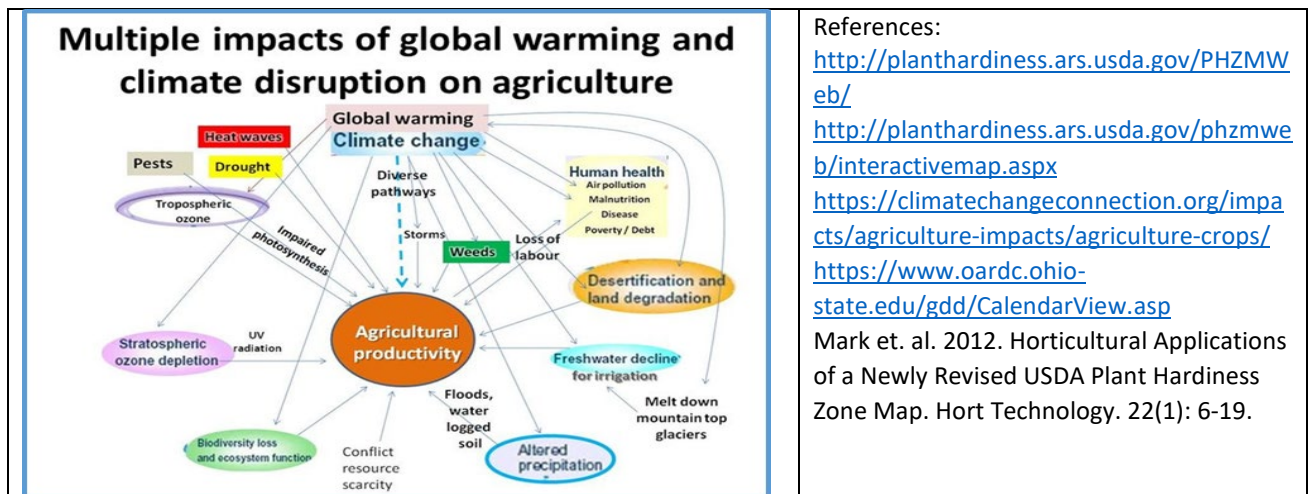
- This edition of the USDA Plant Hardiness Zone Map (PHZM) is GIS (Geographic Information System)-based for the first time
- This is also the first USDA PHZM that is specifically designed for the Internet
- A personal ZIP Code zone finder is also included with this version of the map. Simply type your ZIP Code in the proper box and your zone will be reported
- Zones in this edition of the USDA Plant Hardiness Zone Map (PHZM) are based on 1976–2005 weather data
- The previous edition of the USDA PHZM, revised and published in 1990, was drawn from weather data for 1974–1986
- Two new zones have been added to this edition of the USDA PHZM. Zones 12 and 13 have been introduced for regions with average annual extreme minimum temperatures above 50 degrees and 60 degrees F, respectively
- The new PHZM is generally one half-zone warmer than the previous PHZM throughout much of the United States, as a result of a more recent averaging period (1974–1986 vs. 1976–2005)



2012 Ohio Plant Hardiness Zone Map

(Source: <http://planthardiness.ars.usda.gov/phzmweb/Maps.aspx>)

Impacts of climate change on crop production: Some of the effects are, higher levels of CO₂ may affect the growth rate and yield of crops, whereas higher temperatures or lack of precipitation may influence length of growing season, crop type, or pests found in the field.



References:
<http://planthardiness.ars.usda.gov/PHZMW eb/>
<http://planthardiness.ars.usda.gov/phzmweb/interactivemap.aspx>
<https://climatechangeconnection.org/impacts/agriculture-impacts/agriculture-crops/>
<https://www.oardc.ohio-state.edu/gdd/CalendarView.asp>
 Mark et. al. 2012. Horticultural Applications of a Newly Revised USDA Plant Hardiness Zone Map. Hort Technology. 22(1): 6-19.

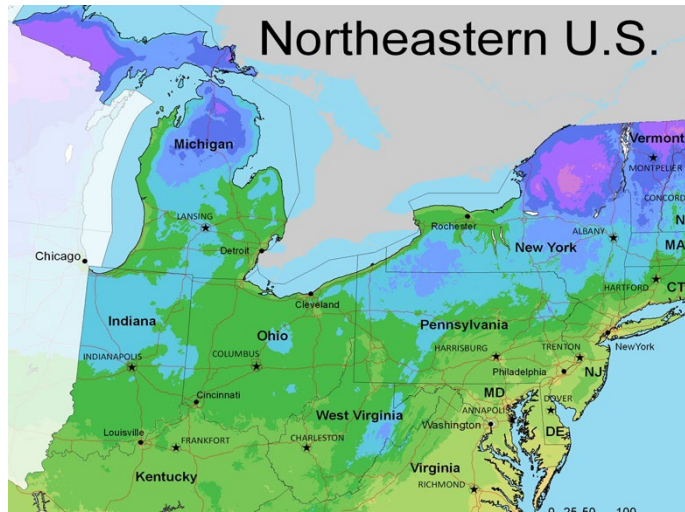
(Source: climatechange-foodsecurity.org)

Lab 3 - Worksheet

Climate and
Weather

Name:

Using the weather data provided, fill in the requested information. You may work in small groups, but each person should submit a worksheet.



<http://planthardiness.ars.usda.gov/PHZMWeb/>

| Average Annual Extreme Minimum Temperature 1976-2005 | | |
|--|------|----------------|
| Temp (F) | Zone | Temp (C) |
| -40 to -35 | 3a | -40 to -37.2 |
| -35 to -30 | 3b | -37.2 to -34.4 |
| -30 to -25 | 4a | -34.4 to -31.7 |
| -25 to -20 | 4b | -31.7 to -28.9 |
| -20 to -15 | 5a | -28.9 to -26.1 |
| -15 to -10 | 5b | -26.1 to -23.3 |
| -10 to -5 | 6a | -23.3 to -20.6 |
| -5 to 0 | 6b | -20.6 to -17.8 |
| 0 to 5 | 7a | -17.8 to -15 |
| 5 to 10 | 7b | -15 to -12.2 |
| 10 to 15 | 8a | -12.2 to -9.4 |

1. What were the three hottest and three coldest temperatures, and their dates in 2015 and 2012?

| 2015 | | 2012 | |
|------|-------------|------|-------------|
| Date | Temperature | Date | Temperature |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

2. Using the USDA Plant Hardiness Zone map (above), which zone would Columbus be placed in for 2015 and 2012? [The map is based on the 20-year average annual min. temperature].

| Year | Minimum temp | USDA Hardiness Zone Number |
|--------------------|--------------|----------------------------|
| 2015 | | |
| 2012 | | |
| Average (USDA map) | | |

3. Record the heavy rainfall events - exceeding 1 in/day. What proportion of total rain fell in heavy events?

| | 2015 | 2012 |
|------------------------|----------------|----------------|
| | heavy rainfall | heavy rainfall |
| | | |
| | | |
| | | |
| | | |
| | | |
| Total 'heavy' rainfall | | |
| Total annual rainfall | | |

Why this information might be useful?

4. How the growing degree days (GDD) for 1 June 2015 (2.2) was calculated? Show **step-by-step** computation for GDD for 1 June 2015. (Hint – what base temperature was used?)
5. a) How the cumulative growing degree days (CGDD) for 1 June 2012 (977.5) was calculated? Show **step-by-step** computation for CGDD for 1 June 2012.
 b) Why did the GDD for 1 June 2015 and 2012 differ?

6. Using the GDD charts, calculate the date when:

| Event | 2015 | 2012 |
|---|------|------|
| Bronze Birch Borer adult emergence (547 GDD needed) | | |
| Cottony Maple Scale Egg Hatch (851 GDD needed) | | |
| Ohio Buckeye full bloom (374 GDD needed) | | |

Why this information might be important?

7. Using the GDD charts, calculate when:

| Event | 2015 | 2012 |
|---|------|------|
| Corn sown 1 May will be mature (2500 GDD needed) | | |
| Corn sown 15 May will be mature (2500 GDD needed) | | |

Why are the harvest dates less than 15 days apart (when these were planted 15 days apart)?

Application for GE Foundations, Natural Science: 4 credits

1. HCS 2200 - The World of Plants Lecture (3 credits)
2. HCS 2203 - Introduction to Plant Science Laboratory (1 credit)

A. Foundations

Please explain in 50-500 words why or how this course is introductory or foundational in the study of Natural Science.

HCS 2200 and HCS 2203 are taught by the Department of Horticulture and Crop Science (HCS). When taken together (HCS 2200 + HCS 2203) will fulfill 4 credits of the GE Foundations, Natural Science category. The World of Plants Lecture (HCS 2200) is a 3-credit course that is currently taught at Ohio State as a Natural Science, Biological Science GE course. Introduction to Plant Science Lab (HCS 2203) is a brand new 1-credit online laboratory. Both HCS 2200 and HCS 2203 follow a similar sequence in topics that introduce a wide breadth of study within this highly interdisciplinary field.

HCS 2200 will fulfill Natural Science Goals 1 and 2, and Expected Learning Outcomes (ELOs) 1.1, 1.2, 2.1, 2.2, and 2.3. HCS 2203 will fulfill Natural Science Goal 1 and ELO 1.3. When the 1-credit HCS 2203 laboratory is taken in combination with the 3-credit HCS 2202 lecture, together these 4-credits (i.e., 1-credit lab + 3-credit lecture) fulfills all Goals (i.e., Goals 1 and 2) and all ELOs (i.e., ELOs 1.1, 1.2, 1.3, 2.1, 2.2, 2.3) for the Foundations, Natural Science GE category.

HCS will offer HCS 2200 and HCS 2203 separately as a 3-credit lecture and 1-credit laboratory, rather than combining them together as a 4-credit course. We want to do this because (1) it will allow for greater flexibility for students when scheduling courses, (2) HCS 2203 will be offered exclusively online each semester, while HCS 2200 will be offered as both an in-person synchronous course Spring semester and an online asynchronous course each semester so that students can choose to take HCS 2200 in-person or online.

HCS 2200 and HCS 2203 will foster an 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. Students will develop a foundational knowledge and understanding of natural sciences to evaluate the economic, social and ethical implications of scientific discoveries and new found technologies. Students will learn that plant science is a multifaceted field of study,

which combines practices, technology, and methods from the biological sciences. Students will develop an understanding for the complex nature of plant ecosystems, how humans are part of and rely on these natural systems, the importance of plants and plant systems, and how different technology and methods can create new uses for plants. Developing scientific literacy skills to encourage life-long learning, will be emphasized throughout the course with high-impact readings, documentaries and the opportunity for students to practice and apply these skills through writing assignments and the creation and presentation of a scientific poster on contemporary topics in environmental science.

HCS 2200 and HCS 2203 will focus on similar topics and follow similar course designs. Course topics will be divided into 8 learning modules (see list below). One module will be taught approximately every two weeks of the semester. Course materials for HCS 2200 and HCS 2203 will be completely free to all students and consist of lecture slides, lecture presentations, lecture transcripts, closed-caption lecture videos, study guides, self-check quizzes, journal articles, book chapters, documentaries, software, technical reports, grading rubrics, and data sets. Course materials will be provided to students through Carmen, the Ohio State Libraries, academic, professional or government websites and online open-source textbooks. Course materials have gone through extensive testing and usage to ensure that they meet accessibility guidelines required by the Ohio State Digital Accessibility Policy. Students who receive accommodations through Student Life Disability Services will receive all required accommodations.

Course Modules for HCS 2200 and HCS 2203:

1. The Scientific Process and Natural Science Literacy
2. Plant Origins, Classification & Use
3. Plant:Climate Relations
4. Plant & Soil Interaction
5. Plant Structure, Growth & Development
6. Plant Reproduction, Proagation and Genetics
7. Mineral Nutrition & Water Requirements
8. Intergrated Pest Management (IPM)

B. Specific Goals for Natural Sciences

GOAL 1: Successful students will engage in theoretical and empirical study within the natural sciences, gaining an appreciation of the modern principles, theories, methods, and modes of inquiry used generally across the natural sciences.

GOAL 1 will be fulfilled in HCS 2200 (Lecture) and HCS 2203 (Laboratory)

Course Modules for HCS 2200 and HCS 2203:

1. The Scientific Process and Natural Science Literacy
2. Plant Origins, Classification & Use
3. Plant:Climate Relations
4. Plant & Soil Interaction
5. Plant Structure, Growth & Development
6. Plant Reproduction, Propagation and Genetics
7. Mineral Nutrition & Water Requirements
8. Integrated Pest Management (IPM)

Expected Learning Outcome 1.1: Successful students are able to explain basic facts, principles, theories and methods of modern natural sciences; describe and analyze the process of scientific inquiry. Please link this ELO to the course goals and topics and indicate specific activities/assignments through which it will be met. (50-700 words)

ELO 1.1 will be fulfilled in HCS 2200 (Lecture)

HCS 2200 - Quizzes (4 quizzes per semester, 10% each, 40% total): Students will complete a total of 4 quizzes each semester. Each exam will consist of 25 questions that focus on 3 weekly course modules. Quizzes will be completed using Carmen and open for 7 days to accommodate all students. Each exam will be unique and worth 10% of a student's Final Grade for HCS 2200. Students will have two attempts and we will keep the highest score between both attempts. Each attempt will contain new questions and answers. Exams will focus on readings, lecture slides and lecture presentations. Exams are open-book, however, students must complete the work on their own without help from peers.

HCS 2200 - Objectives of exams:

1. Evaluate student learning at the end of weekly course modules.
2. Assess reading comprehension, problem solving skills, critical thinking and vocabulary usage.
3. Assess understanding of key concepts principles, theories, and methods.

HCS 2200 - For each exam, students will be required to:

1. Answer multiple-choice, true/false, matching and fill-in-the-blank questions. These questions will be based on lecture slides and presentations given by the instructor.
2. Analyze and interpret data presented in figures, graphs and tables.
3. Use reasoning skills to solve problems using mathematics and statistics.
4. Make quantitative comparisons of data presented in graphs and tables.

Expected Learning Outcome 1.2: Successful students are able to identify how key events in the development of science contribute to the ongoing and changing nature of scientific knowledge and methods. Please link this ELO to the course goals and topics and indicate specific activities/assignments through which it will be met. (50-700 words)

ELO 1.2 will be fulfilled in HCS 2200 (Lecture)

HCS 2200 – Class Discussion (Packback Questions Discussion Forum, 20% total): This forum will be the course discussion platform, to discuss plant science topics relevant to the weekly module and for students to engage with each other. There will be a weekly Sunday at 11.59pm deadline for submissions. In order to receive full credit, students will submit 1 open-ended question per week with a minimum curiosity score of 55 (each worth 33.33% of each assignment grade) and 2 responses per week with a minimum curiosity score of 55 (each worth 66.67% of each assignment grade).

HCS 2200 - Objectives of Packback Questions Discussion Forum:

1. Understand how data is collected by scientists, why replication is important in experiments. Analyze the process of scientific inquiry, principles, theories and methods of natural science.
2. Critically evaluate and responsibly use information from the natural sciences. Analyze data using statistics.
3. Learn how our knowledge and understanding about a scientific discipline has changed over time through the generation of testable explanations and predictions, newfound knowledge, new techniques and new instrumentation.
4. Recognize social and ethical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

HCS 2200 - For each discussion post, students will be required to:

1. Read articles, book chapters and/or technical reports provided by instructor on Carmen or Ohio State Libraries. Watch short documentaries or instructional videos.
2. Ask open-ended, relevant and topical questions each week, and answer questions submitted by their peers. Questions and answers will be based on the articles and book chapters students read, documentaries and instructional videos students watch and data that students collect and analyze.

Expected Learning Outcome 1.3: Successful students are able to employ the processes of science through exploration, discovery, and collaboration to interact directly with the natural world when feasible, using appropriate tools, models, and analysis of data.

Please explain the 1-credit hour equivalent experiential component included in the course: e.g., traditional lab, course-based research experiences, directed observations, or simulations. Please note that students are expected to analyze data and report on outcomes as part of this experiential component. *(50-1000 words)*

ELO 1.3 will be fulfilled in HCS 2203 (Laboratory)

HCS 2203 - Weekly Participation Activities (15 activities per semester, 1% each, 15% total):

Each student will complete a total of 15 weekly participation assignments this semester (1 activity per week), all of which will be submitted on Carmen. Each activity will be open for 7 days to accommodate all students. Each activity will be unique and worth 1% of the student's Final Grade for HCS 2203. These assignments are open-book, however, a student must complete the work on their own without help from peers. A student who demonstrates good faith effort on all aspects of the weekly participation activity and demonstrated engagement in the activity will receive full credit.

HCS 2203 - Objectives of weekly participation activities:

1. To introduce students to each week's lab through readings, instructions or activities.
2. To serve as a formal weekly check-in that promotes and encourages two-way communication between student and instructor.
3. To graph data or organize data in a table. How to calculate mean, standard deviation, range. To compare data between different scientific studies.

HCS 2203 - For each weekly participation activity, students will be required to:

1. Complete a small 15–20-minute task (e.g., graph data, identify unknown samples, construct a scientific table, analyze and/or interpret data) that will be paired with topics contained in weekly modules.

Laboratory Assignments & Quizzes (8, 6.25% each, 50% total): Each student will complete a total of 8 laboratory assignments over 8 labs during the semester, all of which will be submitted on Carmen and due on Sundays at 11:59PM. Each lab will be conducted over one-two weeks and comprise of two related laboratory assignments. For example, Lab Assignment 1 will pertain to the first lab on the Scientific Method (see examples below). Within the first lab assignment, students will collect and report data. Within the second lab assignment students will summarize and analyze class data collected in the first lab assignment. Each assignment will be unique and worth 6.25% of the Final Grade for the course. These assignments are open-book, however, students must complete the work on their own without help from peers. Assignments will be available on Carmen for 7 days to accommodate all students. Readings, data sets, and instructional videos that are required for laboratory assignments will all be free and provided through Carmen.

Objectives of laboratory assignments:

1. Describe common instruments, equipment, techniques and methods used by scientists to collect data. Learn about protocols, operation, benefits and limitations of each.
 - A. Use described methods to collect data and report standardized data to me and to your peer group.
 - B. Analyze consolidated peer group data through calculations (i.e., mean, p-value, standard deviation).
 - C. Summarize consolidated peer group data through visualizations (i.e., graphs, charts, tables).

Each laboratory assignment will consist of two parts:

1. Part 1 - Learn about the lab procedure and how scientists have used the technique or methods in the peer-reviewed literature. Execute the experiment and report standardized data to peer groups on Carmen. Create, analyze and interpret graphs and tables using Microsoft Word and Microsoft Excel.
2. Part 2 - Answer short-answer, multiple choice, matching pairs and T/F quiz questions. These quiz questions will be based on the data that you collect and analyze, and experiments that you conduct on your own at home. Some questions will require you to complete calculations, plot data, analyze tables, and describe procedures and experimental approaches.

Lab Example 1: Growing Degree Day

The data collected in this lab activity will encompass Growing Degree Day data, which is available free online and through the CFAES website.

<https://weather.cfaes.osu.edu/>

Students will use that data to predict natural occurrences such as weed and insect emergence, harvesting dates, flowering, and disease probability. For the Autumn semester class, students will record the average air temperature every day for one week and calculate the Growing Degree Day. Using data collected over a week, students can select five natural phenomena (i.e. plants/insects/disease) that would be active during the growing degree day, from the Phenology garden website.

<https://weather.cfaes.osu.edu/gdd/>

For the Spring semester class, students will conduct the same activity in mid-April, due to rising temperatures above 50 degrees.

Analysis: Students will use collected data to create a graph for temperature over time which includes a prediction for the following: Spring semester: crabgrass/weeds emergence and Autumn semester: last date they plant grass seed.

Lab Example 2: Soil Textural Analysis

Students will collect three soil samples from three different areas from around where they live. Using these samples, students will conduct two practical experiments. These experiments will consist of 1. Hand textural analysis to determine soil texture and record data for each soil sample, 2. A soil settlement test, which allows students to immerse soil in a solution and see how the different soil components settle over time. Students will then measure each layer and plot that information on the USA Soil Texture Calculator (free online tool from USDA website).

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_054167

Analysis: Students will compare their hand textural analysis results with the USDA settlement test, to determine soil texture for each sample. This will help students understand if their first assessment was correct.

Lab Example 3: Strawberry DNA

The strawberry DNA activity will demonstrate how DNA can be isolated from a strawberry using common household materials.

<https://www.genome.gov/Pages/Education/Modules/StrawberryExtractionInstructions.pdf>

Students will compare, 3 underripe, 3 ripe, and 3 overripe strawberries to determine how much white material (DNA) is extracted for each. Results will be recorded and plotted on a graph and posted on Carmen to discuss their results with their peers.

Climate Lab Example – see additional documentation: ClimateLab2022 Example

GOAL 2: Successful students will discern the relationship between the theoretical and applied sciences, while appreciating the implications of scientific discoveries and the potential impacts of science and technology.

GOAL 2 will be fulfilled in HCS 2200 (Lecture)

Course Modules for HCS 2200 and HCS 2203:

1. The Scientific Process and Natural Science Literacy
2. Plant Origins, Classification & Use
3. Plant:Climate Relations
4. Plant & Soil Interaction
5. Plant Structure, Growth & Development
6. Plant Reproduction, Propagation and Genetics
7. Mineral Nutrition & Water Requirements
8. Integrated Pest Management (IPM)

Expected Learning Outcome 2.1: Successful students are able to analyze the inter-dependence and potential impacts of scientific and technological developments. Please link this ELO to the course goals and topics and indicate specific activities/assignments through which it will be met. (50-700 words)

ELO 2.1 will be fulfilled in HCS 2200 (Lecture)

HCS 2200 - Quizzes (4 quizzes per semester, 10% each, 40% total): Students will complete a total of 4 quizzes each semester. Each exam will consist of 25 questions that focus on 3 weekly course modules. Quizzes will be completed using Carmen and open for 7 days to accommodate all students. Each exam will be unique and worth 10% of a student's Final Grade for HCS 2200. Students will have two attempts and we will keep the highest score between both attempts. Each attempt will contain new questions and answers. Exams will focus on readings, lecture slides and lecture presentations. Exams are open-book, however, students must complete the work on their own without help from peers.

HCS 2200 - Objectives of exams:

4. Evaluate student learning at the end of weekly course modules.
5. Assess reading comprehension, problem solving skills, critical thinking and vocabulary usage.
6. Assess understanding of key concepts principles, theories, and methods.

HCS 2200 - For each exam, students will be required to:

5. Answer multiple-choice, true/false, matching and fill-in-the-blank questions. These questions will be based on lecture slides and presentations given by the instructor.
6. Analyze and interpret data presented in figures, graphs and tables.
7. Use reasoning skills to solve problems using mathematics and statistics.
8. Make quantitative comparisons of data presented in graphs and tables.

Expected Learning Outcome 2.2: Successful students are able to evaluate social and ethical implications of natural scientific discoveries. Please link this ELO to the course goals and topics and indicate specific activities/assignments through which it will be met. (50-700 words)

ELO 2.2 will be fulfilled in HCS 2200 (Lecture)

HCS 2200 – Writing Assignments (4 assignments per semester, 30% total): Students will complete a total of 4 writing assignments each semester, all of which will be submitted on Carmen. Each assignment will be unique and worth from 5% to 15% of a student's Final Grade in HCS 2200. Assignments will be open on Carmen for 14 days to accommodate all students. Readings, data sets, documentaries that are required for writing assignments will all be free and provided through Carmen or links to these materials will be provided on Carmen. These assignments are open-book, however, a student must complete the work on their own without help from peers.

HCS 2200 - Objectives of writing assignments:

1. Locate primary source journal article using Web of Science, PubMed or another search engine. Understand how journal articles are organized (e.g., abstract, introduction, results) and how to read an article, find information, interpret data and become proficient at reading and understanding figures, graphs and tables.
2. To make informed decisions and develop potential solutions to environmental issues based on published scientific articles, results and data.
3. Develop skills and gain experience in plant identification and scientific writing, and how to effectively present data using pictures, figures and tables.
4. Gain an appreciation for how discoveries in natural science often requires collaboration between many scientists from many different specializations and from many different cultural backgrounds.

HCS 2200 - For each writing assignment, students will be required to:

1. Answer short-answer and essay-style questions. These questions will be based on readings, documentaries or data provided by academic or governmental institutions. Some questions will require students to use formulas and equations, complete calculations, calculate statistical values, plot data, produce tables, and describe procedures and experimental approaches.
2. Use reasoning skills to propose method, protocol or technique that could be utilized to solve an environmental problem.
3. Evaluate the economic, social and ethical implications of scientific discoveries and new technologies.

Expected Learning Outcome 2.3: Successful students are able to critically evaluate and responsibly use information from the natural sciences. Please link this ELO to the course goals and topics and indicate specific activities/assignments through which it will be met. (50-700 words)

ELO 2.3 will be fulfilled in HCS 2200 (Lecture)

HCS 2200 - Quizzes (5 quizzes per semester, 5% each, 25% total): Students will complete a total of 5 quizzes each semester, all of which will be completed using Carmen. Quizzes will be open for 7 days to accommodate all students. Each quiz will contain 10-20 questions that focuses on 1-2 weekly course modules. Students will have two attempts and we will keep the highest score between both attempts. Each attempt will contain new questions and answers. Each quiz will be unique and worth 5% of the Final Grade for HCS 2200. These quizzes are open-book, however, students must complete the work on their own without help from peers. Quizzes will focus on readings and course materials.

HCS 2200 - Objectives of quizzes:

1. Understand how data is collected by scientists, why replication is important in experiments. Analyze the process of scientific inquiry, principles, theories and methods of natural science.
2. Critically evaluate and responsibly use information from the natural sciences. Analyze data using statistics.
3. Learn how our knowledge and understanding about a scientific discipline has changed over time through the generation of testable explanations and predictions, newfound knowledge, new techniques and new instrumentation.
4. Recognize social and ethical implications of scientific discoveries and understand the potential of science and technology to address problems of the contemporary world.

HCS 2200 - For each quiz, students will be required to:

1. Read articles, book chapters and/or technical reports provided by instructor on Carmen or Ohio State Libraries. Watch short documentaries or instructional videos. There will be no cost to the student, all readings and videos will be free.
2. Answer multiple-choice, true/false, matching and fill-in-the-blank questions. These questions will be based on the articles and book chapters that students read, documentaries and instructional videos that students watch and data that students collect and analyze.

Distance Approval Cover Sheet

For Permanent DL/DH Approval

Course Number and Title: **HCS 2203 Introduction to Plant Science Laboratory**

Faculty Preparer Name and Email: **Pam Sherratt, sheratt.1@osu.edu**

Carmen Use

For more on use of Carmen: <https://teaching.resources.osu.edu/teaching-topics/carmen-common-sense-best-practices>

A Carmen site will be created for the course, including a syllabus and gradebook at minimum. **YES** Select

If no: Enter additional details if you responded no...

Syllabus

Proposed syllabus uses the ODEE distance learning syllabus template (or own college distance learning syllabus template based on ODEE model), includes boilerplate language where required, as well as a clear description of the technical and academic support services offered, and how learners can obtain them. **YES** Select

Syllabus is consistent and is easy to understand from the student perspective. **YES** Select

Syllabus includes a schedule with dates and/or a description of what constitutes the beginning and end of a week or module. **YES - the course schedule is broken down into weeks.** Select

If there are required synchronous sessions, the syllabus clearly states when they will happen and how to access them. **No synchronous sessions.** Select

Additional comments (optional):

Enter any additional comments about syllabus...

Instructor Presence

For more on instructor presence: <https://teaching.resources.osu.edu/teaching-topics/online-instructor-presence>

Students should have opportunities for regular and substantive academic interactions with the course instructor. Some ways to achieve this objective:

- Regular instructor communications with the class via announcements or weekly check-ins
- Instructional content, such as video, audio, or interactive lessons, that is visibly created or mediated by the instructor



- Regular participation in class discussion, such as in Carmen discussions or synchronous sessions
- Regular opportunities for students to receive personal instructor feedback on assignments

Please comment on this dimension of the proposed course (or select/explain methods above):

Delivery Well-Suited to DL/DH Environment

Technology questions adapted from the [Quality Matters](#) rubric. For information about Ohio State learning technologies: <https://teaching.resources.osu.edu/toolsets>

The tools used in the course support the learning outcomes and competencies. **YES** Select

Course tools promote learner engagement and active learning. **YES** Select

Technologies required in the course are current and readily obtainable. **YES** Select

Links are provided to privacy policies for all external tools required in the course. **YES** Select

Additional technology comments:

Enter any additional comments about course technology...

Which components of this course are planned for synchronous delivery and which for asynchronous delivery? (For DH, address what is planned for in-person meetings as well.)

This course is asynchronous with no synchronous or in person meeting times.

If you believe further explanation would be helpful, please comment on how course activities have been adjusted for distance learning:

Enter comments...

Workload Estimation

For more information about calculating online instruction time: [ODEE Credit Hour Estimation](#)

Course credit hours align with estimated average weekly time to complete the course successfully. **YES** Select

Course includes direct (equivalent of "in-class") and indirect (equivalent of "out-of-class") instruction at a ratio of about 1:2. **YES** Select

Provide a brief outline of a typical course week, categorizing course activities and estimating the approximate time to complete them or participate:

Week 4

Recorded online lecture: 1 hour

Participation activity: twenty minutes to complete activity

Lab 3 assignment: 1 hour

Poster assignment 1: 1 hour

In the case of course delivery change requests, the course demonstrates comparable rigor in meeting course learning outcomes. **YES**

Accessibility

For more information or a further conversation, contact the [accessibility coordinator](#) for the College of Arts and Sciences. For tools and training on accessibility: [Digital Accessibility Services](#)

Instructor(s) teaching the course will have taken Digital Accessibility training (starting in 2022) and will ensure all course materials and activities meet requirements for diverse learners, including alternate means of accessing course materials when appropriate. **YES**

Information is provided about the accessibility of all technologies required in the course. All third-party tools (tools without campus-wide license agreements) have their accessibility statements included. **YES**

Description of any anticipated accommodation requests and how they have been/will be addressed.

From HCS 2203 syllabus:

Extended Time (1.5x or 2x) Assignments: SLDS-REGISTERED STUDENTS SHOULD EMAIL THEIR PLAN. A student must send their completed SLDS paperwork to the instructor at sherratt.1@osu.edu. Once accommodations are verified, we will setup all assessments accordingly.

Note Taking Assistance/Recording: PROVIDED TO ALL STUDENTS. We provide all lab presentation slides via Carmen. Fully typed transcripts for lab presentations are provided via YouTube. Students can copy/paste the entire typed transcript anytime using any word processing software (e.g., Microsoft Word) directly from YouTube for all videos. These transcripts serve as written notes for all lectures.

Closed-captioning and transcripts: PROVIDED TO ALL STUDENTS. All required multimedia (e.g., videos, podcasts) are accompanied with closed captioning or transcripts that meet ADA requirements. Most times these features are provided by the content producer (e.g., The New York Times, PBS, NPR, Nature, National Geographic). However, you may find select transcripts produced by the course team and linked in Carmen.

Flexible due dates for assignments: PROVIDED TO ALL STUDENTS. All assignments are open on Carmen for a period of at least 7 days to accommodate students' busy schedules. Students can complete these assignments anytime while the window is open. Extenuating circumstances sometimes occur. Students who miss a due date for a legitimate reason (e.g., emergency, hospital visit, extended illness, unforeseen health issue, homelessness) should contact the instructor before the due date by email (sherratt.1@osu.edu) to request additional time. The instructor will determine if an excuse is acceptable.

Additional comments:

Enter any additional comments about accessibility...



Academic Integrity

For more information: <https://go.osu.edu/teaching-resources-academic-integrity>

The course syllabus includes online-specific policies about academic integrity, including specific parameters for each major assignment: **YES** Select

Assignments are designed to deter cheating and plagiarism and/or course technologies such as online proctoring or plagiarism check or other strategies are in place to deter cheating: **YES** Select

Additional comments:

Enter additional comments about academic integrity...

Frequent, Varied Assignments/Assessments

For more information: <https://teaching.resources.osu.edu/teaching-topics/designing-assessments-student>

Student success in online courses is maximized when there are frequent, varied learning activities. Possible approaches:

- Opportunities for students to receive course information through a variety of different sources, including indirect sources, such as textbooks and lectures, and direct sources, such as scholarly resources and field observation
- Variety of assignment formats to provide students with multiple means of demonstrating learning
- Opportunities for students to apply course knowledge and skills to authentic, real-world tasks in assignments

Comment briefly on the frequency and variety of assignment types and assessment approaches used in this course (or select methods above):

Enter comments, 1-3 sentences...

Community Building

For more information: <https://teaching.resources.osu.edu/teaching-topics/student-interaction-online>

Students engage more fully in courses when they have an opportunity to interact with their peers and feel they are part of a community of learners. Possible approaches:

- Opportunities for students to interact academically with classmates through regular class discussion or group assignments
- Opportunities for students to interact socially with classmates, such as through video conference sessions or a course Q&A forum
- Attention is paid to other ways to minimize transactional distance (psychological and communicative gaps between students and their peers, instructor, course content, and institution)

Please comment on this dimension of the proposed course (or select methods above):

Enter comments, 1-3 sentences...

Transparency and Metacognitive Explanations

For more information: <https://teaching.resources.osu.edu/teaching-topics/supporting-student-learning-your>

Students have successful, meaningful experiences when they understand how the components of a course connect together, when they have guidance on how to study, and when they are encouraged to take ownership of their learning. Possible approaches:

- Instructor explanations about the learning goals and overall design or organization of the course
- Context or rationale to explain the purpose and relevance of major tasks and assignments
- Guidance or resources for ancillary skills necessary to complete assignments, such as conducting library research or using technology tools
- Opportunities for students to take ownership or leadership in their learning, such as by choosing topics of interest for an assignment or leading a group discussion or meeting
- Opportunities for students to reflect on their learning process, including their goals, study strategies, and progress
- Opportunities for students to provide feedback on the course

Please comment on this dimension of the proposed course (or select methods above):
Enter comments, 1-3 sentences...

Additional Considerations

Comment on any other aspects of the online delivery not addressed above:
Enter any additional considerations...