Term Information

Effective Term	Spring 2025

General Information

Course Bulletin Listing/Subject Area	Agricultural Systems Mgmt
Fiscal Unit/Academic Org	Food, Agric & Biological Eng - D1123
College/Academic Group	Food, Agric & Environ Science
Level/Career	Undergraduate
Course Number/Catalog	3585
Course Title	Digital Agriculture
Transcript Abbreviation	DigitalAg
Course Description	Digital Agriculture provides an introduction and overview of the digital processes, digital analytics and visualization, utilization of large data sets (crop, animal, weather, environment, and capital assets) coupled with artificial intelligence tools to produce actionable information that will help to enhance the profitability and sustainability of agricultural production systems.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
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	HCS 2260 or ANIMSCI 2260 or AEDECON 2005 or STAT 1450 or permission of instructor.
Exclusions	Not open to students with credit for AGSYSMT 2580,AGSYSMT 3586, HCS 3585 or HCS 3586
Electronically Enforced	Yes

Cross-Listings

Cross-Listings	HCS 3585

Subject/CIP Code

Subject/CIP Code	01.0301
Subsidy Level	Baccalaureate Course
Intended Rank	Sophomore, Junior, Senior

Requirement/Elective Designation

Sustainability

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

Course Details

Course goals or learning objectives/outcomes

- Successful students will analyze sustainability at a more advanced and in-depth level than in the Foundations component.
- Successful students will integrate approaches to sustainability by making connections to out-of- classroom experiences with academic knowledge or across disciplines.
- Successful students will analyze and explain how social and natural systems function, interact, and evolve over time how human well-being depends on these interactions; how actions have impacts on subsequent generations and societies globally, etc..
- Students will analyze sustainability at a more advanced and in-depth level.

Content Topic List

- Introduction to Digital Agriculture and its Role in Sustainability
- Global Navigation Satellite Systems (GNSS) in Agriculture and Natural Resource Conservation
- ArcGIS and Applications in Agricultural Sustainability
- Farm Management Information Systems (FMIS) for Sustainable Management
- Variable Rate Technology and its Role in Long-Term Soil Health and Sustainability
- Soil Health Soil Sampling and Soil Sensing
- Yield Monitoring Technologies for Optimal Resource Management
- Historical Yield Data and its Implications for Sustainability
- Artificial Intelligence Primer
- Artificial Intelligence and Crop Care
- Controller Area Networks (CAN) and Connected Machines
- The Ethics of Data Ownership, Aggregation, and Cloud Computing
- Google Earth Applications in Production and Urban Agriculture
- Remote Sensing and Applications in Sustainable Agriculture
- Drone Applications in Sustainable Agriculture
- Precision Conservation Management
- Controlled Environment Agriculture
- Tracking Weather and Climate Change
- Precision Livestock Farming Systems
- Managing Pasture Based Livestock Systems
- Crop and Animal Modeling
- Precision Irrigation and Controlled Drainage for Enhance Water Quality
- Internet of Things (IoT) and Sustainability
- On-Farm Research and its role in Digital Agriculture.
- Data Analytics and Visualization for Digital Agriculture
- AI in Marketing and Agricultural Supply Chain Logistics
- Application of Blockchain Technology in Agricultural Supply Chain
- Enterprise Agriculture and Sustainability

Sought Concurrence

Yes

Attachments

- AGSYSMT 3585 GE justification Final_20211130.pdf: GE Justification

  (GEC Model Curriculum Compliance Stmt. Owner: Trefz,Kelvin Eugene)

- AGSYSMT_HCS_3585_3586_Concurrency_request.pdf: List of Depts Concurrence

  (List of Depts Concurrence Requested From. Owner: Trefz,Kelvin Eugene)

- Course_Review_Concurrence_Form_3585_20211210.pdf: Concurrene form

  (Concurrence. Owner: Trefz,Kelvin Eugene)

- Course_Review_Concurrence_Animal_Sciences_AGSYSMT_HCS_3585_20211210.pdf: Animal Sciences 3585

  (Concurrence. Owner: Trefz,Kelvin Eugene)

- Course_Review_Concurrence_Animal_Sciences_AGSYSMT_HCS_3586_20211210.pdf: Animal Sciences 3586

  (Concurrence. Owner: Trefz,Kelvin Eugene)

- Course_Review_Concurrence_Civil_Environmental_Geodetic_Engineering_AGSYSMT_HCS 3585_and_3586.pdf: CECE 3585 and 3586

  (Concurrence. Owner: Trefz,Kelvin Eugene)

- Course_Review_Concurrence_Geography_AGSYSMT_HCS_3585_and_3586.pdf: Geography 3585 and 3586

  (Concurrence. Owner: Trefz,Kelvin Eugene)

- Course_Review_Concurrence_Knowlton Schl of Architecture_AGSYSMT_HCS_3585_and_3586.pdf: Knowlton 3585 and 3586

  (Concurrence. Owner: Trefz,Kelvin Eugene)

- Course_Review_Concurrence_SENR_AGSYSMT_HCS_3585_20211210.pdf: SENR 3585

  (Concurrence. Owner: Trefz,Kelvin Eugene)

- Course_Review_Concurrence_SENR_AGSYSMT_HCS_3586_20211210.pdf: SENR 3586

  (Concurrence. Owner: Trefz,Kelvin Eugene)

- AGSYSMT_HCS_3585_Cover_Letter_202311036.docx: Cover letter

  (Cover Letter. Owner: Trefz,Kelvin Eugene)

- AGSYSMT_HCS_3585_Syllabus_Thematic_20231106.docx: Syllabus

  (Syllabus. Owner: Trefz,Kelvin Eugene)

- AGSYSMT_HCS_3585_Course_Construction_Theme_20231106.docx: Course Construction

  (Other Supporting Documentation. Owner: Trefz,Kelvin Eugene)

- AGSYSMT_HCS_3585_Readings_Theme_20231106.docx: Readings

  (Other Supporting Documentation. Owner: Trefz,Kelvin Eugene)

- AGSYSMT_HCS_3585_Teaching_Schedule_and_Outcomes_Table_Theme_20231106.docx: Teaching Schedule

  (Other Supporting Documentation. Owner: Trefz,Kelvin Eugene)

- AGSYSMT_HCS_3585_Course_Alignment_Map_Revised_Theme_20231106.docx: Course Alignment

  (Other Supporting Documentation. Owner: Trefz,Kelvin Eugene)

- AGSYSMT_HCS_3585_Syllabus_Updated 02-06-2024.pdf: Updated Syllabus from unit

  (Syllabus. Owner: Hilty,Michael)

Comments

- Uploaded corrected syllabus received from unit with administrative corrections. *(by Hilty,Michael on 02/06/2024 08:10 AM)*
- Revise as per COAA via email message 7 February 2022

  Revise as discussed on 27 January 2022

  Revise as per discussion 19 January 2022

  Revise as per discussion 6 January 2022 *(by Osborne,Jeanne Marie on 02/07/2022 04:29 PM)*
- 1. The 7 HW are now 6 and labeled 1-6

  2. Concurrences are coming in, two are currently in (Knowlton and Geography).

  3. I have uploaded a revised Syllabus to reflect the above changes.

  Concurrences requested 01/12/22, as of 12/27/21:

  Animal Sciences – Concurs

  AEDE (management, cryptocurrencies) – not received

  SENR – Concurs

  Geography – Concurs

  College of Engineering including

  Computer Science and Engineering (cloud computing). – not received

  Civil, Environmental & Geodetic Engineering– Concurs

  Knowlton School of Architecture – Concurs *(by Trefz,Kelvin Eugene on 01/12/2022 03:11 PM)*
- I have a few questions that need some clarification:

  1) Length of Course: Both 14 weeks and 12 weeks were selected. Is this because you plan to offer this course during spring, autumn, and summer?

  2) In your syllabus (under grading rubric), you mentioned that there are 7 HW assignments, but only 6 were listed (No. 1, 3, 4, 5, 6 & 7). Please double-check this. These assignment numbers were also referred to in the Inventory file.

  3) I saw the Concurrency Request email dated on Dec. 10 sent to other units. Have you received any response from them? *(by Chen,Qian on 12/20/2021 02:34 AM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Trefz,Kelvin Eugene	12/10/2021 10:41 AM	Submitted for Approval
Revision Requested	Chen,Qian	12/20/2021 02:34 AM	Unit Approval
Submitted	Trefz,Kelvin Eugene	12/21/2021 09:59 AM	Submitted for Approval
Revision Requested	Chen,Qian	12/23/2021 07:29 AM	Unit Approval
Submitted	Trefz,Kelvin Eugene	12/27/2021 08:38 AM	Submitted for Approval
Approved	Chen,Qian	12/28/2021 09:53 AM	Unit Approval
Revision Requested	Osborne,Jeanne Marie	01/06/2022 02:17 PM	College Approval
Submitted	Trefz,Kelvin Eugene	01/12/2022 03:28 PM	Submitted for Approval
Approved	Chen,Qian	01/13/2022 01:09 AM	Unit Approval
Revision Requested	Osborne,Jeanne Marie	01/19/2022 02:11 PM	College Approval
Submitted	Trefz,Kelvin Eugene	01/24/2022 04:33 PM	Submitted for Approval
Approved	Chen,Qian	01/25/2022 03:35 AM	Unit Approval
Revision Requested	Osborne,Jeanne Marie	01/28/2022 10:27 AM	College Approval
Submitted	Trefz,Kelvin Eugene	01/28/2022 10:44 AM	Submitted for Approval
Approved	Chen,Qian	01/28/2022 12:05 PM	Unit Approval
Revision Requested	Osborne,Jeanne Marie	02/07/2022 04:29 PM	College Approval
Submitted	Trefz,Kelvin Eugene	02/10/2022 09:37 AM	Submitted for Approval
Approved	Chen,Qian	02/10/2022 10:42 AM	Unit Approval
Approved	Osborne,Jeanne Marie	02/11/2022 01:40 PM	College Approval
Revision Requested	Hilty,Michael	05/17/2022 04:34 PM	ASCCAO Approval
Submitted	Trefz,Kelvin Eugene	09/09/2022 09:53 AM	Submitted for Approval
Approved	Chen,Qian	09/09/2022 10:50 PM	Unit Approval
Approved	Osborne,Jeanne Marie	09/12/2022 10:42 AM	College Approval
Revision Requested	Hilty,Michael	10/13/2022 11:28 AM	ASCCAO Approval
Submitted	Trefz,Kelvin Eugene	08/01/2023 03:01 PM	Submitted for Approval
Approved	Shearer,Scott Allan	08/01/2023 05:38 PM	Unit Approval
Approved	Osborne,Jeanne Marie	08/04/2023 11:51 AM	College Approval
Revision Requested	Hilty,Michael	10/09/2023 05:24 PM	ASCCAO Approval
Submitted	Trefz,Kelvin Eugene	11/07/2023 09:44 AM	Submitted for Approval
Approved	Shearer,Scott Allan	11/15/2023 08:20 AM	Unit Approval
Approved	Osborne,Jeanne Marie	01/25/2024 12:15 PM	College Approval
Pending Approval	Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Neff,Jennifer Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	01/25/2024 12:15 PM	ASCCAO Approval

THE OHIO STATE UNIVERSITY

Department of Food, Agricultural and Biological Engineering
200A Agricultural Engineering Building
590 Woody Hayes Drive
Columbus, OH 43210-1058

Department of Horticulture and Crop Science
202 Kottman Hall
2021 Coffey Rd
Columbus, OH 43210

November 6, 2023

Dr. Jim Fredal, Faculty Chair of the ASCC Themes Panel
Dr. Maria Conroy, Faculty Chair of the Theme Advisory Group: Sustainability
Michael Hilty, Curriculum and Assessment Assistant
ASC Curriculum and Assessment Services
College of Arts and Sciences
The Ohio State University

Dear Jim, Maria, and Michael,

This letter addresses all the concerns related to AGSYSMT & HCS 3585. Please accept this letter as our response to Michael Hilty's email messages on October 9, October 13, and October 23, 2023, providing subcommittee's feedback and the comments that we received during our Zoom meeting with Dr. Ila Nagar and Michael Hilty on October 20, 2023, regarding approval of AGSYSMT & HCS 3585. We have also corrected all the administrative errors based on the subcommittee's feedback.

"AGSYSMT & HCS 3585 is now a Theme 3 credit hour course and AGSYSMT & HCS 3586 is a 4-credit hour High-Impact Practice course with laboratory."

The above-mentioned email messages are presented below for your reference. We have retained subcommittee's comments related to AGSYSMT/HCS 3585 from the e-mail messages and addressed those comments in this letter. We will submit a separate letter for Subcommittee's feedback on AGSYSMT/HCS 3586.

> *Note: After discussion with Bernadette Vankeerbergen (Vankeerbergen.1), ASC Assistant Dean for Curriculum, and Meg Daly (Daly.66), Associate Dean for Undergraduate Education the Team has decided to keep AGSYSMT/HCS 3585 as a 3 credit hours course without the laboratory component and combine the lecture and laboratory components in to one course. - AGSYSMT/HCS 3586 as 4 credit hours offering. December 12, 2022*

Subcommittee's feedback on October 9, 2023

> **From:** Hilty, Michael <hilty.70@osu.edu>
> **Sent: Monday, October 9, 2023 5:20 PM**
> **To:** Trefz, Kelvin <trefz.1@osu.edu>; Luikart, Meredith <luikart.6@osu.edu>; Osborne, Jeanne <osborne.2@osu.edu>
> **Cc:** Nagar, Ila <nagar.5@osu.edu>; Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>; Steele, Rachel <steele.682@osu.edu>; Neff, Jennifer <neff.363@osu.edu>
> **Subject:** Agricultural Systems Management and HCS 3585 & 3586
>
> Good afternoon,

On Wednesday, September 20th, the Themes 2 Subcommittee of the ASC Curriculum Committee reviewed a High-Impact Practice: Integrated and Collaborative Teaching request for HCS/ASM 3585/3586.

The Subcommittee declined to vote on the proposals, as there were some administrative errors, they require be fixed prior to a review taking place:

- The reviewing faculty noticed that it does not appear that the proper revisions have been made to the syllabi that were provided. Per the cover letter provided, it appears the intention of the units is that the 3585 version of the course would become a 3-credit hour Theme course, while the 3856 version would become a 4-credit hour Theme and High-Impact Practice course. Based upon the syllabi provided and the forms filled out in curriculum.osu.edu, this does not appear to have happened. The reviewing faculty ask that the proper documents be provided and the forms in curriculum.osu.edu for all four courses be corrected so that they may review the new, revised versions of the courses.

I will return ASM/HCS 3585 and 3586 to the departmental queues via curriculum.osu.edu in order to address the administrative error above.

Should you have any questions, please do not hesitate to reach out to Ila Nagar, faculty Chair of the Themes 2 Subcommittee, or me.

All my best,

Michael

THE OHIO STATE UNIVERSITY

Michael Hilty
Curriculum and Assessment Coordinator
ASC Staff Advisory Council, Awards Chair

Subcommittee's feedback on October 13, 2022

From: *Hilty, Michael <hilty.70@osu.edu>*
Sent: Thursday, October 13, 2022, 11:26 AM
To: *Trefz, Kelvin <trefz.1@osu.edu>; Osborne, Jeanne <osborne.2@osu.edu>; Luikart, Meredith <luikart.6@osu.edu>*
Cc: *Putikka, Bill <putikka.1@osu.edu>; Conroy, Maria <conroy.36@osu.edu>; Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>; Steele, Rachel <steele.682@osu.edu>; Cody, Emily <cody.50@osu.edu>*
Subject: *Agricultural Systems Management & HCS 3585 and 3586*

Good morning,

On Tuesday, September 27th, the Themes 2 Panel of the ASC Curriculum Committee reviewed a new GEN Theme: Sustainability with High-Impact Practice: Interdisciplinary Team-Teaching request for Agricultural Systems Management & HCS 3585 and 3586. Please see below for the Panel's feedback.

GEN Theme: Sustainability:

The Panel unanimously approved the request with one contingency and one recommendation. As a reminder, the Panel's contingency must be satisfied in a revision submitted to www.curriculum.osu.edu while the Panel's recommendation may be implemented when the course is next taught.

- ***Contingency:*** *The reviewing faculty ask that more clarification be provided regarding which textbook is being referenced and utilized within the course syllabus and how this chosen text will connect to the GEN Theme: Sustainability Goals and ELOs.*

- ***Recommendation:*** *The reviewing faculty recommend clearly establishing student expectations regarding what texts they will need to purchase and utilize on the course syllabus.*

- *Additionally, the reviewing faculty ask that the departments reach out to Bernadette Vankeerbergen (Vankeerbergen.1), ASC Assistant Dean for Curriculum, and Meg Daly (Daly.66), Associate Dean for Undergraduate Education, to discuss alternative ways for this course to be proposed as the they are still unclear on the 3+1 model and how/where the team-teaching will be taking place.*

- *The reviewing faculty request a cover letter that details all changes made in response to their feedback.*

I will return Agricultural Systems Management & HCS 3585 and 3586 to the departmental queues via curriculum.osu.edu in order to address the Panel's feedback above.

Should you have any questions, please do not hesitate to reach out to Bill Putikka, faculty Chair of the ASCC Themes 2 Panel, Maria Conroy, faculty Chair of the Theme Advisory Group: Sustainability, or me.

All my best,
Michael

THE OHIO STATE UNIVERSITY

Michael Hilty
Curriculum and Assessment Assistant
ASC Curriculum and Assessment Services The College of Arts and Sciences
306 Dulles Hall, 230 Annie and John Glenn Ave, Columbus, OH 43210
614-247-6089 Office
hilty.70@osu.edu / asccas.osu.edu
Pronouns: he/him/his, they/them/theirs / Honorific: Mx.

Subcommittee's feedback on October 23, 2023

From: Hilty, Michael <hilty.70@osu.edu>
Sent: Monday, **October 23, 2023 7:28 AM**
To: Trefz, Kelvin <trefz.1@osu.edu>
Cc: Steele, Rachel <steele.682@osu.edu>; Nagar, Ila <nagar.5@osu.edu>; Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>
Subject: Noticed Administrative Errors for HCS/ASM 3585 + 3586

Good morning Kelvin,

I hope you had a nice weekend! I found our meeting on Friday afternoon to be very productive, and I hope you and your team did as well.

Please see below for the administrative errors that I noticed in the syllabi for 3585 and 3586, as promised:

HCS 3585

- Curriculum.osu.edu form: The exclusions should be "AGSYSMT 3585, and AGSYSMT/HCS 3586" in addition to any additional content-based exclusions (such as AGSYSMT 2580 that your unit already has).
- Syllabus page 2: Please ensure the exclusions match the curriculum.osu.edu form.
- Syllabus page 5: Please remove all references to the High-Impact Practice throughout the entire course syllabus, not just on this page, but I did notice a reference on this page as an example.

AGSYSMT 3585:

- Syllabus page 2: Please ensure the exclusions match the curriculum.osu.edu form. (They are correct in the curriculum.osu.edu form for this entry)
- Syllabus page 5: Please remove all references to the High-Impact Practice throughout the entire course syllabus, not just on this page, but I did notice a reference on this page as an example. Please let me know if you have any additional questions that I can help with as you resubmit! I hope you find this helpful.

I've cc'd to this email Ila Nagar, the faculty Chair of the Themes 2 Subcommittee, Bernadette Vankeerbergen, ASC Assistant Dean for Curriculum, and Rachel Steele, ASC Curriculum Program Manager.
All my best,
Michael

THE OHIO STATE UNIVERSITY

Michael Hilty
Curriculum and Assessment Coordinator
ASC Staff Advisory Council, Awards Chair

Our response to subcommittee's feedback on October 9, 2023

- The reviewing faculty noticed that it does not appear that the proper revisions have been made to the syllabi that were provided. Per the cover letter provided, it appears the intention of the units is that the 3585 version of the course would become a 3-credit hour Theme course, while the 3856 version would become a 4-credit hour Theme and High-Impact Practice course. Based upon the syllabi provided and the forms filled out in curriculum.osu.edu, this does not appear to have happened. The reviewing faculty ask that the proper documents be provided and the forms in curriculum.osu.edu for all four courses be corrected so that they may review the new, revised versions of the courses.
    - 1. The reviewing faculty noticed that it does not appear that the proper revisions have been made to the syllabi that were provided. Per the cover letter provided, it appears the intention of the units is that the 3585 version of the course would become a 3-credit hour Theme course.
        - A new correct syllabus for 3585 has been uploaded to curriculum.osu.edu.

Theme and High-Impact Practice

- The text relating to High-Impact Practice has been removed from syllabus.

The reviewing faculty ask that the proper documents be provided and the forms in curriculum.osu.edu for all four courses be corrected so that they may review the new, revised versions of the courses.

- The proper documentation has been provided for AGSYSMT/HCS 3585 in curriculum.osu.edu.

Our response to subcommittee's feedback on October 13, 2022

GEN Theme: Sustainability:

The Panel unanimously approved the request with one contingency and one recommendation. As a reminder, the Panel's contingency must be satisfied in a revision submitted to curriculum.osu.edu while the Panel's recommendation may be implemented when the course is next taught.

1. Contingency: The reviewing faculty ask that more clarification be provided regarding which textbook is being referenced and utilized within the course syllabus and how this chosen text will connect to the GEN Theme: Sustainability Goals and ELOs.

- 1.a The syllabus (AGSYSMT/HCS 3585-page 6-7) now clearly indicates the three main textbooks, plus four other optional textbooks being used. Additionally, the readings for the main textbooks are clearly indicated in the Course Schedule, at the end of the syllabus, and in Carmen.
- 1.b The Sustainably Goals and ELOs are paired with the Course CLOs which are linked to the textbook readings as shown on AGSYSMT/HCS 3585-pages 2-5. In addition, the AGSYSMT_HCS_3585_Course_Alignment_Map_Revised has the Theme Goals and ELO's specifically linked to the textbook readings.

2. Recommendation: The reviewing faculty recommend clearly establishing student expectations regarding what texts they will need to purchase and utilize on the course syllabus.

- 2.a AGSYSMT/HCS 3585 - page 6) of the syllabus clearly states that each of the textbooks listed are available as free - eBooks online with the Ohio State University Libraries. In most cases, the students can download the required materials and they can also elect to read them online without downloading.
- 2.b All readings (textbooks and articles) are listed in the Course Schedule under "Readings" at the end of the syllabus. In addition, we have put together a document (AGSYSMT_HCS_3585_Readings) that list the lectures along with textbook information and the corresponding chapter readings.

- *3. Additionally, the reviewing faculty ask that the departments reach out to Bernadette Vankeerbergen (Vankeerbergen.1), ASC Assistant Dean for Curriculum, and Meg Daly (Daly.66), Associate Dean for Undergraduate Education, to discuss alternative ways for this course to be proposed as the they are still unclear on the 3+1 model and how/where the team-teaching will be taking place.*
  - 3.1. The Departments met with Meg Daly and Bernadette Vankeerbergen on *December 12, 2022,* and discussed interdisciplinary team teaching and the following.
  - 3.2. Meg Daly confirmed that the committee prefers faculty from both the departments to be present for the lectures.
  - 3.3. Meg and Bernadette suggested that we create AGSYSMT/HCS 3585 as a 3-credit hours course without the laboratory component and AGSYSMT/HCS 3586 as a 4 credit hours course with the laboratory component incorporated in the course.
  - 3.4. The 3 + 1 may be developed at a future date once we understand how the 3 +1 works between separate lecture and laboratory courses.

- 3.5. Our response: after our discussion with Bernadette Vankeerbergen and Meg Daly, we have decided to keep AGSYSMT/HCS 3585 as a 3 credit hours course without the laboratory component and combine the lecture and laboratory components in to one course - AGSYSMT/HCS 3586 as a 4-credit hour offering.

Our response to subcommittee's feedback on October 23, 2023

HCS 3585

Curriculum.osu.edu form: The exclusions should be "AGSYSMT 3585, and AGSYSMT/HCS 3586" in addition to any additional content-based exclusions (such as AGSYSMT 2580 that your unit already has).

- This has been corrected.

Syllabus page 2: Please ensure the exclusions match the curriculum.osu.edu form.

- The syllabus does match curriculum.osu.edu.

Syllabus page 5: Please remove all references to the High-Impact Practice throughout the entire course syllabus, not just on this page, but I did notice a reference on this page as an example.

- All references to High Impact Practices have been removed from the syllabus.

AGSYSMT 3585

Syllabus page 2: Please ensure the exclusions match the curriculum.osu.edu form. (They are correct in the curriculum.osu.edu form for this entry)

- The syllabus does match curriculum.osu.edu.

Syllabus page 5: Please remove all references to the High-Impact Practice throughout the entire course syllabus, not just on this page, but I did notice a reference on this page as an example.

- All references to High Impact Practices have been removed from the syllabus.

- *The reviewing faculty request a cover letter that details all changes made in response to their feedback.*
  - Please refer to this letter.

We would like to thank the subcommittee for their constructive feedback and Michael Hilty for helping us with the process.

Sincerely,

Scott A. Shearer, Ph.D., P.E.
Professor & Chair, FABE

David J. Barker, Ph.D.
Professor & Associate Chair for Academic Programs, HCS

Digital Agriculture Syllabus

AGSYSMT/HCS 3585 Spring 2025

Course Information

Course times and location: Tuesdays and Thursdays; time and location: TBD
Credit hours: 3
Mode of delivery: In Person

Instructors

Department of Food, Agricultural and Biological Engineering:

Name: Dr. Scott Shearer
Email: shearer.95@osu.edu (preferred)
Phone: (614) 292-7284
Office location: 590 Woody Hayes Drive
Office hours: TBD.

Name: Dr. John Fulton
Email: fulton.20@osu.edu (preferred)
Phone: 614-292-6625
Office location: 590 Woody Hayes Drive
Office hours: TBD.

Department of Horticulture and Crop Science:

Name: Dr. David Barker
Office location: 226 Kottman Hall
E-mail: barker.169@osu.edu (preferred)
Phone: (614) 247-6258
Office Hours: TBD

Name: Dr. Guilherme Signorini
Office location: 225 Howlett Hall
E-mail: signorini.2@osu.edu (preferred)
Phone: no phone
Office Hours: TBD

Name: Dr. Alex Lindsey
Office location: 312A Kottman Hall
E-mail: lindsey.227@osu.edu (preferred)
Phone: (614) 292-3864
Office Hours: TBD

Course Coordinator

Department of Horticulture and Crop Science:
Name: Dr. Ramarao Venkatesh
301 Kottman Hall
E-mail: venkatesh.1@osu.edu (preferred)
Phone: (614) 688-4204
Office Hours: TBD

Preferred contact method:

First contact with any instructor should be at Ohio State email address. Student will receive a response within **24 hours**. Class-wide communications will be sent through the Announcements tool in CarmenCanvas. Please check your notification preferences (go.osu.edu/canvas-notifications) to be sure you receive these messages.

Course Prerequisites

HCS 2260 or ANIMSCI 2260 or AEDECON 2005 or STAT 1450.

Course Description

Catalog Description: Digital Agriculture provides an introduction and overview of the digital processes, digital analytics and visualization, utilization of large data sets (crop, animal, weather, environment, and capital assets) coupled with artificial intelligence tools to produce actionable information that will help to enhance the profitability and sustainability of agricultural production systems.

Extended Description: Digital Agriculture provides an overview of the emergence of data-driven processes and using it to make management decisions in agriculture. This advancement of digital tools and analytics seeks to combine large data sets and sources with crop, animal, weather, environment, and capital asset management models, coupled with artificial intelligence, to produce actionable information to enhance the sustainability and profitability of agriculture production systems. Simply stated, "digital agriculture" is the "generation and analysis of large data sets to produce actionable information." This course seeks to provide perspective and a lexicon for students interested in learning more about the data-driven agriculture. Recent developments including cloud computing and the "Internet of Things" are reshaping nearly every facet of agricultural production including food, fiber, energy, and processing and distribution of products downstream of the farm gate. It is first in a series of courses that will address the impact of data-driven management decisions on agricultural production, sustainability, and food and energy security.

For digital agriculture, sustainability is defined as the ability of growers to have agricultural production systems that are efficient and profitable, that minimizes the impact to the land, air, and water, and that enhances the quality of life for local, national, and global communities. The following are some of the *sustainability concepts* covered in this course: Carbon Cycling and Sequestration [CCS], Climate Smart Agriculture [CSA], Food Production Optimization and Efficiency [FOE], Food Safety [FSA], Food Security [FTY], Nitrogen and Phosphorus Cycling and Use Efficiency [NPC], Water Quality and Quantity [WQQ].

General Education Goals and Expected Learning Outcomes

As part of the Sustainability Theme of the General Education curriculum, this course is designed with the following Goals and Expected Learning Outcomes:

GE Goal 1: Successful students will analyze sustainability at a more advanced and in-depth level than in the Foundations component.

Expected Learning Outcomes (ELO)

- ELO 1.1 Engage in critical and logical thinking about the topic or idea of sustainability. CLO 1.1, CLO 1.2, CLO 1.4

- ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of sustainability. CLO 1.2, CLO 1.4, CLO 2.5

GE Goal 2: Successful students will integrate approaches to sustainability by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.

Expected Learning Outcomes

- ELO 2.1 Identify, describe and synthesize approaches or experiences as they apply to sustainability. CLO 1.2, CLO 2.1, CLO 2.2, CLO 2.5

- ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment and creative work, building on prior experiences to respond to new and challenging contexts. CLO 2.3, CLO 2.4

GE Goal 3: Successful students will analyze and explain how social and natural systems function, interact, and evolve over time; how human well-being depends on these interactions; how actions have impacts on subsequent generations and societies globally; and how human values, behaviors and institutions impact multifaceted potential solutions across time.

Expected Learning Outcomes

- ELO 3.1 Describe elements of the fundamental dependence of humans on Earth and environmental systems, and on the resilience of these systems. CLO 1.3

- ELO 3.2 Describe, analyze, and critique the roles and impacts of human activity and technology on both human society and the natural world, in the past, present and future. CLO 1.3

ELO 3.3 Devise informed and meaningful responses to problems and arguments in the area of sustainability based on the interpretation of appropriate evidence and an explicit statement of values. CLO 1.1

AGSYSMT/HCS 3585 course fulfills ALL of the Sustainability Theme Learning Goals and Expected Learning Outcome:

Students will engage in analyzing sustainability at a more advanced and in-depth level. Students will use integrated approaches to study sustainability by making connections between their out-of-classroom experiences, academic knowledge across disciplines, and past/future work. Students will analyze and explain:

- how social and natural systems function, interact, and evolve over time;
- how human well-being depends on these interactions;
- how these actions have an impact on subsequent generations and societies globally; and
- how human values, behaviors, and institutions have an impact on multifaceted potential sustainability solutions across time.

This course fulfills the General Education learning objectives for the Sustainability Theme by:

- Engaging in critical and logical thinking about the topic of sustainability through a series of lectures, discussions, and writing (Homework, Guest Speaker Reflections, Technical Feasibility and Sustainability Study). The course will expose students to different types of data sets that are generated on a farm and how they could be used to implement the best crop management practices that helps to reach sustainability goals.

- Engaging in a semester-long in-depth and advanced scholarly exploration of sustainability in the Technical Feasibility and Sustainability Study and in the homework's.
- Analyzing, and providing visualization of the data sets that helps to communicate the results to public, stakeholder groups (local or global communities) that helps to make informed decisions towards a more sustainable future.
- Throughout the semester students will submit written reflections on the Guest Speakers, descriptions of their work, and their view of the impact of digital agriculture on sustainability for the next "ten years.". Additional writings about, thought leaders, current trends, sources of data generated on the farm, and the future of digital agriculture will help to develop the student's knowledge base in digital agriculture and sustainability. This will improve their ability to interact with other students from other disciplines and stakeholders who are interested in sustainability.
- The lecture topics provide descriptions of the interactions between human activity, technology, and societal norms in relation to the environment and impact of their interactions on sustainability based on the data generated from various sources on the farm. The delicate balance of meeting societal needs with the increasing population requires a new approach. Students will learn how data is gathered on the farm and analyzed to make informed decisions taking into consideration productivity and sustainability.
- Describing, analyzing, and critiquing the roles and impacts of human activity and technology on both the society and the environment will help students to understand there needs to be a delicate balance between the needs and desires of an increasing population considering the natural resources required to meet those demands in the future.
- Devising informed and meaningful responses to problems and issues related to sustainability based on the interpretation of appropriate evidence and an explicit statement of values. Knowledge gained in this course will help students to understand digital technologies and their application to evaluate the impact of different conventional and new food production systems on sustainability. The experiences from the course will allow the student to make informed decisions in real life about the impact of production practices on sustainability.

This course is taught collaboratively by two departments - Food, Agricultural and Biological Engineering, (FABE), and Horticulture and Crop Science, (HCS). Although this course addresses several sustainability concepts (Carbon Cycling and Sequestration, Climate-Smart Agriculture, Food Safety, Food Security, Food Production Optimization and Efficiency, Nitrogen and Phosphorus Cycling and Use Efficiency, Water Quality and Quantity), as a generalization, FABE faculty will take an engineering/technology approach to address sustainability topics and HCS will take a biophysical approach focused on plant science. Within HCS, a range of interdisciplinary approaches including whole plant ecophysiology and agricultural supply chain management (applied economics) will be considered to address sustainability topics. Lectures will be conducted separately by the faculty allowing the respective disciplinary approaches to be presented to students. The homework assignments (7), Guest Speaker Reflection (3) and Technical Feasibility and Sustainability Study (1) will allow students to draw upon these various disciplinary approaches to the topic. For example, Carbon Cycling and Sequestration might include an engineering component (no-tillage vs full tillage cultivation), a biophysical component (crop selection, or fertilization to promote plant root growth and productivity), or a value chain approach (marketing of organic vs conventional produce).

Students will work with large scale complex problems throughout the entire course centered on food system operations (small holder vs corporate) that have an impact on the environment, sustainability, profitability, how technology impacts food, fuel, fiber, energy production practices, logistics, and careers (current and future). Students will have opportunities to revisit, analyze, and synthesize the material taught in the course. Students can compare their knowledge and understand the complex issues of digital agriculture, food, fuel, and fiber production systems and chart how their knowledge and understanding has changed across time. The content and procedures learned in this course will not only provide the basis for completing class assignments and activities but can be applied to future courses and employment.

Course Goals and Course Learning Outcomes (CLO)

By the end of this course, students should successfully be able to:

Course Goal 1. Students will analyze sustainability at a more advanced and in-depth level.

CLO 1.1 *Develop* responses to problems and arguments in sustainability based on data, definitions, principles, theories, methods, history, and development of data driven agriculture that allow effective communication of results to farmers/workforce and society that helps to plan their farm operations. ELO 1.1, 3.3

CLO 1.2 Using digital agriculture *analyze* how multiple sources and disciplines, expert viewpoints, and technologies have an impact on sustainability. Show the impact on the environment, political, natural, cultural, social aspects and allow farmers to have economic and environmental benefits from their operations. ELO 1.1, 1.2

CLO 1.3 *Describe*, *analyze*, and *critique* the roles and impacts of human activity and digital technologies on humans, society, and the environment past, present, and future. ELO 3.1, 3.2

CLO 1.4 *Model* data collection, analysis, interpretation of results, and effective communication of the results to farmers/workforce that helps them to plan efficient farm operations. ELO 1.1, 1.2

Course Goal 2. Successful students will integrate approaches to sustainability by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in the future.

CLO 2.1 *Compare* the technologies (Applied IoT, Artificial Intelligence, Blockchain, Controlled Environment Agricultures, Data Mining, Enterprise Agriculture, On-Farm Research, Variable Rate Application, RFID) used in digital agriculture and food systems as they have an impact on sustainability, environment, and society in the world around us. ELO 2.1

CLO 2.2 *Evaluate* the impact of digital agriculture [production, processing, and distribution systems (plant and livestock)] on sustainability under different disciplinary lenses, multi-cultural, diverse perspectives applied to complex sustainability concepts. ELO 2.1

CLO 2.3 *Examine* how **your understanding** of sustainability concepts, scholarly approach, and knowledge has changed since the beginning of the course. ELO 2.2

CLO 2.4 Using the sustainability concepts ***Create* your own definition** of, and the role of digital agriculture then *Create* a second definition and role from a different person's perspective. *Evaluate* the similarities and differences based on the two perspectives. ELO 2.2

CLO 2.5 *Categorize and Compare* how digital agriculture uses intelligent networks and data management on the data that is generated, stored, has ownership, privacy, security, ethics, and technologies influence sustainability (plant, animal, and soil environments). ELO 1.2, 2.1

How This Course Works

Mode of delivery: In Person

The classes are on Tuesdays and Thursdays. The rest of your work is found in Carmen and can be completed around your own schedule during the week. For the 28 lectures during the semester, 13 will be co-led by instructors from both Departments to ensure integration of content presented in previous and current sessions. Fifteen lectures will be led by individual instructors (seven lectures by FABE faculty and eight lectures by HCS faculty) to discuss their disciplinary expertise.

Pace of activities:

This course is divided into **weekly modules**. Students are expected to keep pace with weekly deadlines but may schedule their efforts freely within that time frame.

Credit hours and work expectations:

This is a 3 credit-hour multi-disciplinary team-taught course. According to Ohio State bylaws on instruction (go.osu.edu/credit hours), students should expect around 3 hours per week of time spent on direct instruction (instructor content and Carmen activities, for example) in addition to 6 hours of homework activities (reading and assignment preparation, for example) to receive a grade of C average.

Please note: This includes studying, reviewing, and editing notes, discussing with fellow students, etc. and does not equate to assignments and homework activities.

Attendance and participation requirements:

Research shows regular participation is one of the highest predictors of success. With that in mind, the instructor has the following expectations for everyone's participation:

- **Attendance:** You are expected to attend all classes.
- **Participation:** Your participation in class is essential to your success. Participation includes Answering questions in class when called upon; sharing relevant insights of examples from your experiences; Asking questions if you do not understand the material.
- In case of emergencies and other circumstances that prevent you from attending, please contact the instructor as soon as possible by email. Official documentation (e.g., from a doctor's office or hospital, or interviewer, etc.) must be provided. If you miss a lab session, please discuss how to make up the lab with the instructor in a different time.

Course Materials, Fees, and Technologies

Required Materials and/or Technologies.

The following are general textbooks which will provide background information. Specific chapters from these and other textbooks may be assigned by the instructors.

All materials are available from the OSU library free of cost. Off-campus access to most OSU Library resources may be obtained through these routes. Accessed 31 Oct. 2023.

- **[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 Accessed 31 Oct. 2023.
- **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 Accessed 31 Oct. 2023.
- **[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 Accessed 31 Oct. 2023.https://ebooks.ohiolink.edu/viewer/e7ec4ef2-6500-11eb-af00-0a9b31268bf5/1 Accessed 31 Oct. 2023.

In addition, journal articles will be assigned from time to time by the instructors and will be posted to CarmenCanvas.

Recommended/Optional Materials and/or Technologies.

- The instructors will provide you with supplementary reading materials periodically and will be announced during the lecture. They will be uploaded to CarmenCanvas.
- The course instructors will update additional material/sources for students during individual lectures. Digital agriculture area is dynamic and new research is published on an ongoing basis. Instructors will be interacting with Dr. Florian Diekman, science liaison librarian, throughout the semester. He serves as Head of the Food, Agricultural, and Environmental Sciences Library at The Ohio State University. Florian provides research and teaching support for the students, faculty, staff, and alumni of the College of Food, Agricultural, and Environmental Sciences, and members of the public.
- **All materials are available from the OSU library free of cost. Off-campus** access to most OSU Library resources may be obtained through these routes. Accessed 31 Oct. 2023.
    - [TRB] Crawley, M. J. (2013). The R book (Second). Wiley. Retrieved July 21, 2022, https://osu.on.worldcat.org/oclc/809365744 Accessed 31 Oct. 2023.
    - [OAG] *Ohio Agronomy Guide 15th Edition, Bulletin 472* | *Agronomic Crops Network*. https://agcrops.osu.edu/publications/ohio-agronomy-guide-15th-edition-bulletin-472. Accessed 31 Oct. 2023.
    - [EBS] *EBarns – Putting Data in Producers' Hands | Ohio BEEF Cattle Letter*. https://u.osu.edu/beef/2022/08/24/ebarns-putting-data-in-producers-hands/. Accessed 31 Oct. 2023.
    - [EFS] *EFields On-Farm Research* | *Digital Ag*. https://digitalag.osu.edu/efields. Accessed 31 Oct. 2023.

Fees and/or Additional Requirements

- None

Required Equipment

- **Computer:** current Mac (MacOS) or PC (Windows 10) with high-speed internet connection
- **Webcam:** built-in or external webcam, fully installed and tested
- **Microphone:** built-in laptop or tablet microphone or external microphone
- **Other:** a mobile device (smartphone or tablet to use for BuckeyePass authentication

If you do not have access to the technology you need to succeed in this class, review options for technology and internet access at go.osu.edu/student-tech-access.
You can use any electronic device to access the course in CarmenCanvas and perform all of the function needed to complete the course. There may be additional directions or restrictions for some of the activities as noted in those activities.

Required Software

- Microsoft Office 365**:** All Ohio State University students are now eligible for free Microsoft Office 365 ProPlus through Microsoft's Student Advantage program. Full instructions for downloading and installation is found Office 365 - Installation of Office for Windows/Mac for Students.
- Zotero**:** You also need to install the ASABE style by going to Zotero Style Repository then select American Society of Agricultural and Biological Engineers or, ZoteroBib to build bibliography without downloading the app and style. Instructions are found ZoteroBib FAQ.

CarmenCanvas Access

You will need to use BuckeyePass (buckeyepass.osu.edu) 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 do each of the following:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device (go.osu.edu/add-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.
- Install the Duo Mobile application (go.osu.edu/install-duo) on 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 IT support staff will work out a solution with you.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- Basic knowledge of statistics (from prerequisites)
- Navigating CarmenCanvas (go.osu.edu/canvasstudent)
- CarmenZoom virtual meetings (go.osu.edu/zoom-meetings)
- Recording a slide presentation with audio narration and recording, editing, and uploading video (go.osu.edu/video-assignment-guide

Technology Support

For help with your password, university email, CarmenCanvas, or any other technology issues, questions, or requests, contact the IT Service Desk, which offers 24-hour support, seven days a week.

- **Self Service and Chat**: go.osu.edu/it
- **Phone:** 614-688-4357 (HELP)
- **Email:** servicedesk@osu.edu

Grading and Faculty Response

How Your Grade is Calculated

Assignment Category	Percentage
Guest Speaker Reflections (3), Homeworks (7), and Discussions	**10%**
Quizzes (6)	**10%**
Technical Feasibility and Sustainability Study (1)	**20%**
Exams (2) (20% each)	**40%**
Final Exam (1)	**20%**
Total	**100%**

See Course Schedule for due dates.

Descriptions of Major Course Assignments

Description: During the semester, you will complete various assignments (Discussion Post, Homework, Guest Speaker Reflections), Quizzes, a Technical Feasibility and Sustainability Study, Exams, and Final Exam. Assignments may not be turned in after the due date (not counting excused absences). If an exception is not made, they will be penalized 20% for each day late. Persons with excused absences (verified illness, academic conflict) may in some cases be able to make up the material. In these cases, if it is not feasible to duplicate a missed assignment, the assignment will not be factored into the final grade. Specific course requirements are listed next. **See page 16 for the Late Assignment Policy.**

Discussions, Guest Speaker Reflections, and Homework will count for 10% of your final grade.

Discussion

Non-Graded – General Discussions about the course, questions to the instructors, and normal course operations.
Graded –

- Technical Feasibility and Sustainability Study video discussions: Post and comment on another student's video
- Students will Post weekly to the following:
  - Student Reflections – work on definitions, technology, basic science, and process.
  - Student Journals for students to reflect on their learning in a private space.

  Goal 2 [CLO 2.3 (ELO 2.2), ELO 2.2]

Homework (HWK)

Students will have homework to complete. Be sure to understand the specifics of the homework and respond accordingly. A total of seven (7) Homework exercises will be given during the entire duration of the course.

We are training you to become professionals. With this in mind, your work should be of high quality. **For each homework, we will provide you with a specific rubric relevant to the assigned homework**. **Partial credit will be given.**

Here are some examples of HWKs titles

HWK 1 – Sustainable Production Systems
HWK 2 – Social Media As a "Knowledge Tool" For Sustainable Food Production
HWK 3 – Conferences. as a "Knowledge Tool" for Digital Agriculture
HWK 4 – Data Interoperability in Sustainable Digital Agriculture
HWK 5 – Google Earth Engine (GEE) and its applications
HWK 6 – Ethics of Data Ownership
HWK 7 – Sustainability-Digital Agriculture: Thought Leader Changes Across the Semester

Sample Homework Rubric	
Grading Scale 4-point scale – 4 (exceeds expectations - >90%), 3 (meets expectations - 80-90%), 2 (meets $^{2}/_{3}$ of the expectations 70-80%), 1 (meets $^{1}/_{3}$ of the expectations - 60-70%), and 0 (unsatisfactory - <60%)	**Score**
Homework Requirements	**0 to 4 pts.**
A. Write out the objective of the homework, do not include any irrelevant details	
B. Demonstrate thorough understanding of topic using complete and accurate information	
C. Present information in a knowledgeable manner	
D. Use three or more referenced resources to gather information including speaking with stakeholders and experts	
E. Use appropriate resources (peer reviewed publications, trade publications, websites, videos etc. using the ASABE Style Guide	
Subtotal	
Homework Organization	**0 to 4 pts.**
1. Visual appeal and clarity, figures and maps are neatly done with proper labeling	
2. Legible, neatness, and creativity	
3. Homework is complete and on time	
4. Successfully meet the objective(s) of the homework	
5. Written homework without any typos and clearly written	
Subtotal	
Total (0 to 40 pts.)	

Guest Speaker Reflections

Invited Guest Speakers are experts in digital agriculture and its impact on digital agriculture. They will provide real world data and their experience with sustainability and digital agriculture. A tentative list of guest speakers will be compiled with input and feedback from the instructors involved in teaching the course. In the first lecture,

the instructor will share the list with the students and ask for their feedback. If they suggest a guest speaker that they would like to invite, the instructor will work the students and invite that guest speaker if they are available.

Each Outside Expert will answer structured questions [1] Self-introduction: background, education, & current position; current responsibilities and career path that led to the current position; [2] provide a definition of digital agriculture based on your experience; [3] three significant events/technologies shaping digital agriculture at present. [4] three possible events/technologies in the future that could change the face of digital agriculture; [5] current and future job opportunities for graduates with digital agriculture background in their company; [6] education and skill set required for graduates to be employed in the digital agriculture sector) in addition to questions from the students. Students will attend three (3) presentations and participate in question-and-answer (Q & A) sessions. They will write a report on the guest speakers' presentation. Students will write a 400 to 800 words report by providing their comments on the presentation and Q & A session. The report will be graded based on the rubric developed for the guest speaker reflections assignment. The report is designed to elicit the student's views, a critique of the experts' presentation in relation to the impact on them as an individual and on agricultural production, the environment/sustainability, and society (local, national, global).

Sustainability Concepts

Carbon Cycling and Sequestration
Climate-Smart Agriculture
Food Safety
Food Security
Food Production Optimization and Efficiency
Nitrogen and Phosphorus Cycling and Use Efficiency
Water Quality and Quantity

Goal 1 [CLO 1.1 (ELO 1.1, 3.3), CLO 1.2 (ELO 1.1, 1.2), CLO 1.3 (ELO 3.1, 3.2), CLO 1.4 (ELO 1.1, 1.2 a)]
Goal 2 [CLO 2.1 (ELO 2.1), CLO 2.2 (ELO 2.1), CLO 2.5 (ELO 1.2, 2.1)]

Technical Feasibility and Sustainability Study (TFSS):

The objective of this assignment is to understand the implications of technology and its potential for adoption. You will develop a feasibility study document highlighting the implications of adopting a new technology or a practice. You should provide a thoughtful analysis of how this technology will affect the private sector (disruption, profitability, consolidation/decentralization, vertical integration, etc.) based on your review of the existing literature and/or other sources of information. Imagine a company has approached you and you are responsible for putting together a feasibility study about a product/technology they desire to purchase or develop. Will this be a sound investment for the company, and what if any concerns should they be aware of regarding the regulatory landscape as well as social implications? A detailed rubric will be provided.

The Technical Feasibility and Sustainability Study will count for 20% of your final grade and *Draft* and *Final* should be ten (10) pages in length (11 pt. font, double spaced, and inclusive of figures). It should include the following sections: Introduction, Explanation of technology or practice, Meaningful insights about the technical feasibility, relevance, and credibility of the technology, Factors affecting adoption of the technology, Growth/adoption potential for proposed technology, Impact of the technology on Sustainability concepts. Recommendations to improve technology adoption, Economic benefits of technology adoption and Creative visual presentation of data/information is encouraged. Due Week 13.

You will create a 90 to 120 sec video about your study and post it to the TTSS Discussion board and you will present your study in class during Week 15.

Goal 1 [CLO 1.1 (ELO 1.1, 3.3); CLO 1.2 (ELO 1.1, 1.2), CLO 1.3 (ELO 3.1, 3.2, CLO 1.4 (ELO 1.1, 1.2
Goal 2 [CLO 2.1 (ELO 2.1), CLO 2.2 (ELO 2.1), CLO 2.3 (ELO 2.2), CLO 2.4 (ELO 2.2), CLO 2.5(ELO 1.2, 2.1)]

Technical Feasibility and Sustainability Study (TFSS) Sections and Due Dates

All sections should be 11 pt. font, double-spaced.

1. 5 pts – **Topic title Due Week 2** No rubric
2. 5 pts – **Class presentation, video, and discussion of the video TBA**
3. 15 pts – **Introduction (200+ words)** and relevance of the topic **Due Week 4.** Use the Introduction Section in the Technical Feasibility and Sustainability Study Rubric below.
4. 15 pts– **References and Information Sources** Background and literature sources **Due Week 6** Use the References and Information Sources Section in the Rubric below.
5. 20 pts – **Draft** – **Due Week 11** Use Technical Feasibility and Sustainability Study Rubric below
6. 40 pts – Final version of the Technical Feasibility and Sustainability Study **Due Week 14** Use Technical Feasibility and Sustainability Study Rubric below

   The rubric below is used for grading the draft and the final version. Total 100 pts for Technical Feasibility and Sustainability Study

Technical Feasibility and Sustainability Study Rubric *[Draft points]* (Final points)

Performance Indicator	Exceeds Expectations *[4-6]* (9-12 pts)	Meets Expectations *[2-3]* (6-9 pts)	Partially Meets Expectations *[1-2]* (3-6 pts)	Unsatisfactory *[0-1]* (0-3 pts)	Possible Points
Introduction	Thoroughly, but concisely introduces sustainability effects of the technology/practice and excellent understanding of the technology.	Introduction sufficient, but slightly flawed.	Little introductory information; flawed and incomplete understanding of the technology.	Poorly stated or missing introductory information.	*[6]* **(12)** pts
Technology and Sustainability Description	Well-defined, clear description; supported by research that thoroughly, but concisely defines requirements.	Technology description sufficient; not stated in clear, concise manner; supported by research defines requirements.	Poor technology description; not stated in clear, concise manner; supported by research.	Flawed and/or incomplete understanding of the technology; not stated in clear, concise manner; no supporting research.	*[6]* **(12)** pts
Background and Relevance	Thoroughly, but concisely describes background and relevance information;	Background and relevance information sufficient, but slightly flawed.	Little background and relevance information; flawed and incomplete understanding of the technical topic.	Poorly stated or missing background and relevance information.	*[6]* **(12)** pts

Performance Indicator	Exceeds Expectations *[4-6]* (9-12 pts)	Meets Expectations *[2-3]* (6-9 pts)	Partially Meets Expectations *[1-2]* (3-6 pts)	Unsatisfactory *[0-1]* (0-3 pts)	Possible Points
	excellent understanding of the sustainable technical topic and foundational information.				
Considerations for Adoption	Well-defined considerations for adoption; answers market potential; well-documented and clear sustainability and technical considerations.	Considerations for adoption are sufficient, may lack creativity; addresses market potential; well documented.	Considerations for adoption lack creativity; partially addresses market potential; adequate documentation.	Considerations for adoption are lacking; do not address market potential; no creativity; poorly documented.	*[6]* **(12)** pts
Economic Sustainability and Social Acceptance Analyses	Excellent, well-documented economic sustainability and social acceptance analyses.	Sound economic sustainability and social acceptance analyses.	Flawed and/or incomplete economic sustainability and social acceptance analyses.	Poorly developed economic sustainability and social acceptance analyses; do not meet minimal expectations.	*[6]* **(12)** pts
Final Recommendation	Definitive system solution recommendation, cost effective and well supported by thoughtful and complete analyses.	Sound system solution recommendation, is cost effective and supported by thoughtful analyses.	Flawed and/or incomplete system solution recommendation, biased towards a particular solution which is not supported by analyses.	Unclear recommendation; poorly support – lacking system(s) analyses and comparison of alternatives.	*[4]* **(8)** pts
Organization	Organization pattern is logical and conveys completeness and wholeness.	Organization pattern is logical and conveys completeness and wholeness with few lapses.	Attempt at organization, but little sense of wholeness and completeness.	Ad-hoc structure, little evidence of organization, little or no sense of wholeness and completeness.	*[4]* **(8)** pts

Performance Indicator	Exceeds Expectations *[4-6]* (9-12 pts)	Meets Expectations *[2-3]* (6-9 pts)	Partially Meets Expectations *[1-2]* (3-6 pts)	Unsatisfactory *[0-1]* (0-3 pts)	Possible Points
Grammar/Style	Consistently follows the rules for standard English. Uses effective language, makes engaging, appropriate word choices for audience/ purpose.	Generally, follows the rules for standard English. Uses effective language and appropriate word choices for intended audience/ purpose.	Generally, does not follow the rules of standard English. Limited and predictable vocabulary, perhaps not appropriate for intended audience/ purpose.	Does not follow rules of standard English. Limited or inappropriate vocabulary for the intended audience and purpose.	*[4]* **(8)** pts
Figures and Tables	Figures and tables always support the text and are well designed.	Figures and tables generally support the text and are usually well designed.	Figures and tables sometimes support the text, and sometimes well designed.	Figures and tables do not support the text or are poorly designed.	*[4]* **(8)** pts
References and Information Sources	References and other sources of information cited for material used in the report. All sources support the discussion.	References and other sources of information cited for material used in the report. Most of the sources are appropriate to support the discussion.	References and other sources of information not cited for some material used in the report, or inappropriate sources cited.	References and other sources of information consistently not cited for material used in report.	*[4]* **(8)** pts

Quizzes – Biweekly (selected questions may also be used in Exams)

40 questions (true/false 20 at 1 point each, multiple choice 20 2 points each)
Given in Carmen, 3 attempts – highest score, Open Book Open Notes
Quizzes covering lecture material and reading assignments will count for 10% of your final grade.
Goal 1 [CLO 1.1 (ELO 1.1, 3.3); CLO 1.2 (ELO 1.1, 1.2), CLO 1.3 (ELO 3.1, 3.2, CLO 1.4 (ELO 1.1, 1.2)]
Goal 2 [CLO 2.1 (ELO 2.1), CLO 2.2 (ELO 2.1), CLO 2.3 (ELO 2.2), CLO 2.4 (ELO 2.2), CLO 2.5(ELO 1.2, 2.1)]

Exams (refer to the schedule)

50 questions each (true/false, multiple choice)
Given in Carmen, 1 attempt, Closed Book and Notes
Two Exams covering reading and lecture materials will count for 20% X 2 for 40%

Exam 1 – [ELO 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.3]
Goal 1 [CLO 1.1 (ELO 1.1, 3.3); CLO 1.2 (ELO 1.1, 1.2), CLO 1.3 (ELO 3.1, 3.2)]
Goal 2 [CLO 2.1 (ELO 2.1), CLO 2.2 (ELO 2.1), CLO 2.3 (ELO 2.2)]

Exam 2 – [ELO 1.1, 1.2, 2.1, 3.1, 3.2, 3.3]
Goal 1 [CLO 1.1 (ELO 1.1, 3.3); CLO 1.2 (ELO 1.1, 1.2), CLO 1.3 (ELO 3.1, 3.2), CLO 1.4 (ELO 1.1, 1.2)]
Goal 2 [CLO 2.1 (ELO 2.1); CLO 2.4(ELO 2.2); CLO 2.5 (ELO 1.2, 2.1)]

Final Exam (refer to the schedule)

50 questions each (true/false, multiple choice)
Given in Carmen, 1 attempt, Closed Book and Notes
A comprehensive final exam will be administered at the end of the semester during the regularly scheduled final exam period. You will be given sample questions during the last week of class. The final exam will count for 20% of your final grade.
ELO 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 3.3

Goal 1 [CLO 1.1 (ELO 1.1, 3.3); CLO 1.2 (ELO 1.1, 1.2), CLO 1.3 (ELO 3.1, 3.2, CLO 1.4 (ELO 1.1, 1.2)]
Goal 2 [CLO 2.1 (ELO 2.1), CLO 2.2 (ELO 2.1), CLO 2.3 (ELO 2.2), CLO 2.4 (ELO 2.2), CLO 2.5(ELO 1.2, 2.1)]

Grading Scale

Grade	Range
A	100 % to 93.0%
A-	< 93.0 % to 90.0%
B+	< 90.0 % to 87.0%
B	< 87.0 % to 83.0%
B-	< 83.0 % to 80.0%
C+	< 80.0 % to 77.0%
C	< 77.0 % to 73.0%
C-	< 73.0 % to 70.0%
D+	< 70.0 % to 67.0%
D	< 67.0 % to 60.0%
E	< 60.0 % to 0.0%

Academic integrity and collaboration:

Quizzes

You must complete the quizzes yourself, using your notes. Quizzes will be based on the announced content/readings/weeks/lectures.

Exams

You must complete the final exam yourself, without any external help or communication.

Written Assignments

Your written assignments, including discussion posts, should be your own original work. In formal assignments, you should follow ASABE style to cite the key words and references. 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.

Reusing Past Work

In general, you are prohibited in university courses from turning in work from a past courses to your current class, even if you modify it. If you want to build on past research or revisit a topic you have explored in previous courses, please discuss the situation with instructor.

Falsifying Research or Results

All research that you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.

Collaboration and Informal Peer-Review

The course includes many opportunities for formal collaboration with your classmates. While study groups and peer-review of major written projects is encouraged, remember that comparing answers on a quiz or assignment is not permitted. If you are unsure about a particular situation, please feel free just to ask ahead of time.

Late Assignments

Please refer to Carmen for due dates. Due dates are set to help you stay on pace and to allow timely feedback that will help you complete subsequent assignments.

- For the Homework or Guest Speaker Reflections you may drop a total of two of the lowest score of two (except as noted in the Evaluation section).
- Late work will have 20% of the total points deleted for each day it is late. Five (5) days late you will receive zero (0 points). This is based on the timestamp in Carmen, anything after the deadline is the next day and 20% off. In the case of documented emergency or illness, please contact the Course Coordinator as soon as possible to discuss accommodations, which will be determined on a case-by-case basis.

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) at any time if you have a technical problem.

- **Preferred contact method:** If you have a question, please contact me first through my Ohio State email address. I will reply to emails within **24 hours on days when class is in session at the university**.
- 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-HELP at any time if you have a technical problem.

- **Class announcements:** I will send all important class-wide messages through the Announcements tool in CarmenCanvas. Please check your notification preferences (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:**
    - Instructors will share grading duties and base scoring on defined criteria.
    - For large weekly assignments, you can generally expect feedback within 7 school days.
    - For exams, you can generally expect feedback within 2 weeks.

Other Course Policies

Discussion and 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.
- 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.

Academic Integrity Policy

See Descriptions of Major Course Assignments for specific guidelines about collaboration and academic integrity in the context of this class.

Ohio State's Academic Integrity Policy

The Committee on Academic Misconduct (COAM) recommends that every faculty member, instructor, and graduate teaching associate who is teaching a course prepare and distribute (or make available) to all students a course syllabus that contains a statement concerning "academic misconduct" or "academic integrity". The Ohio State University does not have a standardized statement on academic misconduct that instructors can use in their syllabi. Thus, COAM has prepared the following statement, which course instructors are free to use (with or without modification) for their syllabi:

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 I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my 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:

- Committee on Academic Misconduct (go.osu.edu/coam)
- Ten Suggestions for Preserving Academic Integrity (go.osu.edu/ten-suggestions)
- Eight Cardinal Rules of Academic Integrity (go.osu.edu/cardinal-rules)

Artificial Intelligence and Academic Integrity

There has been a significant increase in the popularity and availability of a variety of generative artificial intelligence (AI) tools, including ChatGPT, Sudowrite and others. These tools will help shape the future of work, research and technology but when used in the wrong way, they can stand in conflict with academic integrity at Ohio State.

All students have important obligations under the Code of Student Conduct to complete all academic and scholarly activities with fairness and honesty. Our professional students also have the responsibility to uphold the professional and ethical standards found in their respective academic honor codes. Specifically, students are not to use unauthorized assistance in the laboratory, on field work, in scholarship or on a course assignment unless such assistance has been authorized specifically by the course instructor. In addition, students are not to submit their work without acknowledging any word-for-word use and/or paraphrasing of writing, ideas or other work that is not your own. These requirements apply to all students undergraduate, graduate, and professional.

To maintain a culture of integrity and respect, these generative AI tools should not be used in the completion of course assignments unless an instructor for a given course specifically authorizes their use. Some instructors may approve of using generative AI tools in the academic setting for specific goals. However, these tools should be used only with the explicit and clear permission of each individual instructor, and then only in the ways allowed by the instructor.

RESOURCES FROM THE DRAKE INSTITUTE FOR TEACHING AND LEARNING
RESOURCES FROM THE TEACHING AND LEARNING RESOURCE CENTER

COMMITTEE ON ACADEMIC MISCONDUCT (COAM)

Copyright for Instructional Materials

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.

Counseling and Consultation Services/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. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing.

If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614- 292-5766. CCS is located on the 4th floor of the Younkin Success Center and 10th floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at 614- 292-5766 and 24-hour emergency help is also available through the 24/7 by dialing 988 to reach the Suicide and Crisis Lifeline.

For CFAES students they can contact 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.

Disability Statement (with Accommodations for COVID)

Requesting Accommodations

The university strives to maintain a healthy and accessible environment to support student learning in and out of the classroom. 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. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

If you are isolating while waiting for a COVID-19 test result, please let me know immediately. Those testing positive for COVID-19 should refer to the Safe and Healthy Buckeyes site for resources. Beyond five days of the required COVID-19 isolation period, I may rely on Student Life Disability Services to establish further reasonable accommodations. You can connect with them at slds@osu.edu; 614-292-3307; or slds.osu.edu.
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. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services.

Disability Services Contact Information

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

Diversity Statement

The Ohio State University affirms the importance and value of diversity of people and ideas. We believe in creating equitable research opportunities for all students and to providing programs and curricula that allow our students to understand critical societal challenges from diverse perspectives and aspire to use research to promote sustainable solutions for all. We are committed to maintaining an inclusive community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among all members; and encourages each individual to strive to reach their own potential. The Ohio State University does not discriminate on the basis of age, ancestry, color, disability, gender identity or expression, genetic information, HIV/AIDS status,

military status, national origin, race, religion, sex, gender, sexual orientation, pregnancy, protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment.

To learn more about diversity, equity, and inclusion and for opportunities to get involved, please visit:

https://odi.osu.edu/
https://odi.osu.edu/racial-justice-resources
https://odi.osu.edu/focus-on-racial-justice
https://cbsc.osu.edu

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 (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility (go.osu.edu/zoom-accessibility)
- Overview of Accessibility at OSU and OSU Privacy

Specific course software's accessibility privacy statements

Vendor Accessibility	Vendor Privacy
Carmen (Canvas accessibility)	Carmen (Canvas/Infrastructure Privacy)
CarmenZoom accessibility	CarmenZoom Privacy
Adobe Connect (Carmen Connect Accessibility)	Adobe Privacy Policy
MediaSite Accessibility Statement	MediaSite Privacy
Microsoft Office Accessibility	Microsoft Office 365 Privacy
Proctorio Accessibility	Proctorio Privacy
Top Hat Accessibility	Top Hat Privacy

Grievances and Solving Problems

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 3335-8-23. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

Religious Accommodations

Ohio State has had a longstanding practice of making reasonable academic accommodations for students' religious beliefs and practices in accordance with applicable law. In 2023, Ohio State updated its practice to align with new state legislation. Under this new provision, students must be in early communication with their instructors regarding any known accommodation requests for religious beliefs and practices, providing notice of specific dates for which they request alternative accommodations within 14 days after the first instructional day of the course. Instructors in

turn shall not question the sincerity of a student's religious or spiritual belief system in reviewing such requests and shall keep requests for accommodations confidential.

With sufficient notice, instructors will provide students with reasonable alternative accommodations with regard to examinations and other academic requirements with respect to students' sincerely held religious beliefs and practices by allowing up to three absences each semester for the student to attend or participate in religious activities. Examples of religious accommodations can include, but are not limited to, rescheduling an exam, altering the time of a student's presentation, allowing make-up assignments to substitute for missed class work, or flexibility in due dates or research responsibilities. If concerns arise about a requested accommodation, instructors are to consult their tenure initiating unit head for assistance.

A student's request for time off shall be provided if the student's sincerely held religious belief or practice severely affects the student's ability to take an exam or meet an academic requirement **and** the student has notified their instructor, in writing during the first 14 days after the course begins, of the date of each absence. Although students are required to provide notice within the first 14 days after a course begins, instructors are strongly encouraged to work with the student to provide a reasonable accommodation if a request is made outside the notice period. A student may not be penalized for an absence approved under this policy.

If students have questions or disputes related to academic accommodations, they should contact their course instructor, and then their department or college office. For questions or to report discrimination or harassment based on religion, individuals should contact the **Office of Institutional Equity**.

Policy: Religious Holidays, Holy Days and Observances

Course Schedule

Refer to the CarmenCanvas course for up-to-date deadlines. (XXX indicates textbook, A-YYY indicates articles)
Carbon Cycling and Sequestration [CCS], Climate Smart Agriculture [CSA], Food Production Optimization and Efficiency [FOE], Food Safety [FSA], Food Security [FTY], Nitrogen and Phosphorus Cycling and Use Efficiency [NPC], Water Quality and Quantity [WQQ].

Lecture#	Week	Topics	Assignments, Assessments	Learning Outcomes	Instructors	Readings
1	**1**	Introduction to Digital Agriculture and its Role in Sustainability	[CSA]	CLO 1.1, CLO 1.2, CLO 1.3, CLO 2.4	FABE HCS	DAS Chap 1 PAB Chap 1 WPA Chap 1.2.3
2	**1**	Global Navigation Satellite Systems (GNSS) in Agriculture and Natural Resource Conservation	[CSA]	CLO 1.1	FABE	DAS Chap 2 PAB Chap 3
3	**2**	ArcGIS and Applications in Agricultural Sustainability	**HWK 1** [CSA]	CLO 1.1, CLO 1.3, CLO 2.4, CLO 2.5	FABE HCS	DAS Chap 3 PAB Chap 4
4	**2**	Farm Management Information Systems (FMIS) for Sustainable Management	**TFSS Topic Title** [CCS], [CSA], [FOE], [FSA], [FTY], [NPC], [WQQ]	CLO 1.2, CLO 1.3	FABE HCS	DAS Chap 15 PAB Chap 2,4,7,11 WPA Chap 1,2 A-CCS-2 A-CCS-9 A-FPO-4 A-FPO-5
5	**3**	Variable Rate Technology and its Role in Long-Term Soil Health and Sustainability	**Quiz 1** [CCS], [CSA], [FOE], [NPC], [WQQ]	CLO 1.1, CLO 1.3, CLO 1.4, CLO 2.1, CLO 2.4	FABE HCS	DAS Chap 9 PAB Chap 2,7,11 WPA Chap 1,2 A-CCS-3 A-CCS-6 A-WQQ-4 A-WQQ-7 A-WQQ-9 A-FPO-4 A-FPO-5
6	**3**	Soil Health Soil Sampling and Soil Sensing	**Guest Speaker Reflection 1** [CSA], [NPC], [WQQ]	CLO 1.1, CLO 2.4, CLO 2.5	HCS	DAS Chap 6 PAB Chap 6 WPA Chap 3,4,5 A-CCS-6 A-CCS-10 A-WQQ-4

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Digital Agriculture

Lecture#	Week	Topics	Assignments, Assessments	Learning Outcomes	Instructors	Readings
						A-WQQ-9
7	**4**	Yield Monitoring Technologies for Optimal Resource Management	**HWK 2** [CCS], [CSA], [FOE]	CLO 1.1, CLO 1.3, CLO 2.4, CLO 2.5	FABE HCS	DAS Chap 8
8	**4**	Historical Yield Data and its Implications for Sustainability	**TFSS Introduction** [CCS], [CSA], [FOE], [FSA], [FTY], [NPC], [WQQ]	CLO 1.1, CLO 1.3, CLO 2.5	FABE	PAB Chap 12
9	**5**	Artificial Intelligence Primer	**Quiz 2** [CSA]	CLO 2.1	FABE	The instructors will provide copies of current articles.
10	**5**	Artificial Intelligence and Crop Care	[CSA]	CLO 2.1	FABE HCS	The instructors will provide copies of current articles.
11	**6**	Controller Area Networks (CAN) and Connected Machines	**HWK 3** [CSA]	CLO 1.1, CLO 1.3, CLO 2.1, CLO 2.5	FABE	PAB Chap 1o
12	**6**	The Ethics of Data Ownership, Aggregation, and Cloud Computing	**TFSS Reference and Information** [CCS], [CSA], [FOE], [FSA], [FTY], [NPC], [WQQ]	CLO 2.1, CLO 2.4, CLO 2.5	FABE HCS	WPA 1.2.4
13	**7**	Google Earth Applications in Production and Urban Agriculture	**Quiz 3** **HWK 4** [CSA], [FOE]	CLO 1.1	FABE	The instructors will provide copies of current articles.
14	**7**	Remote Sensing and Applications in Sustainable Agriculture	**Guest Speaker Reflection 2** [CCS], [CSA], [FOE], [FSA],	CLO 2.5	FABE	DAS Chap 4 PAB Chap 8,9

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Lecture#	Week	Topics	Assignments, Assessments	Learning Outcomes	Instructors	Readings
			[FTY], [NPC], [WQQ]			
15	**8**	Drone Applications in Sustainable Agriculture	**Exam 1** [CSA], [FOE]	CLO 1.1, CLO 2.5	FABE HCS	DAS Chap 7
16	**8**	Precision Conservation Management	[CSA], [FOE], [FSA], [FTY]	CLO 2.5	FABE	A-WQQ-4
17	**9**	Controlled Environment Agriculture	**Quiz 4** [CSA], [FOE], [FSA], [FTY]	CLO 1.1, CLO 2.5	FABE HCS	A-CCS-2 A-WQQ-4
18	**9**	Tracking Weather and Climate Change	**Guest Speaker Reflection 3** [CSA]	CLO 2.5	HCS	The instructors will provide copies of current articles.
	10	Spring Break				
	10	Spring Break				
19	**11**	Precision Livestock Farming Systems	**HWK 5** [CSA], [WQQ]	CLO 1.1, CLO 2.5,	FABE HCS	DAS Chap 11 WPA 1,9
20	**11**	Managing Pasture Based Livestock Systems	**TFSS Draft** [CCS], [CSA], [FOE], [FSA], [FTY], [NPC], [WQQ]	CLO 1.2, CLO 2.5	HCS	A-FPO-4 A-FPO-5
21	**12**	Crop and Animal Modeling	[FOE], [FSA], [FTY]	CLO 1.2, CLO 1.3, CLO 1.4	HCS	A-FPO-4 A-FPO-5
22	**12**	Precision Irrigation and Controlled Drainage for Enhance Water Quality	**Quiz 5** [NPC], [WQQ]	CLO 1.1, CLO 2.5	FABE HCS	DAS Chap 10 WPA Chap 6 A-FPO-5 A-WQQ-1
23	**13**	Internet of Things (IoT) and Sustainability	**HWK 6** [CCS], [CSA], [FOE], [FSA], [FTY], [NPC], [WQQ]	CLO 1.1, CLO 2.4	HCS	DAS Chap 12
24	**13**	On-Farm Research and its role in Digital Agriculture.	**TFSS Final** [CCS], [CSA], [FOE], [FSA], [FTY], [NPC], [WQQ]	CLO 1.1, CLO 1.4	FABE HCS	PAB Chap 13 A-CCS-6 A-FPO-4 A-FPO-5
25	**14**	Data Analytics and Visualization for Digital Agriculture	[CSA], [FOE], [FSA], [FTY]	CLO 1.2, CLO 1.4	HCS	DAS Chap 13 WPA 1
26	**14**	AI in Marketing and Agricultural Supply Chain Logistics	**Exam 2** [CSA], [FOE]	CLO 2.1, CLO 2.4	HCS	The instructors will provide

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Digital Agriculture

Lecture#	Week	Topics	Assignments, Assessments	Learning Outcomes	Instructors	Readings
						copies of current articles.
27	**15**	Application of Blockchain Technology in Agricultural Supply Chain	**Quiz 6 TFSS Presentation** [CCS], [CSA], [FOE], [FSA], [FTY]	CLO 2.5	HCS	The instructors will provide copies of current articles.
28	**15**	Enterprise Agriculture and Sustainability	**HWK 7 TFSS Presentation** [CCS], [CSA], [FOE], [FSA], [FTY], [NPC], [WQQ]	CLO 1.1, CLO 1.4, CLO 2.2	FABE HCS	PAB Chap 14,15 A-WQQ-4
		Finals	Final			

GE THEME COURSES

Overview

Courses that are accepted into the General Education (GE) Themes must meet two sets of Expected Learning Outcomes (ELOs): those common for all GE Themes and one set specific to the content of the Theme. This form begins with the criteria common to all themes and has expandable sections relating to each specific theme.

A course may be accepted into more than one Theme if the ELOs for each theme are met. Courses seeing approval for multiple Themes will complete a submission document for each theme. Courses seeking approval as a 4-credit, Integrative Practices course need to complete a similar submission form for the chosen practice. It may be helpful to consult your Director of Undergraduate Studies or appropriate support staff person as you develop and submit your course.

Please enter text in the boxes to describe how your class will meet the ELOs of the Theme to which it applies. Please use language that is clear and concise and that colleagues outside of your discipline will be able to follow. You are encouraged to refer specifically to the syllabus submitted for the course, since the reviewers will also have that document Because this document will be used in the course review and approval process, you should be *as specific as possible*, listing concrete activities, specific theories, names of scholars, titles of textbooks etc.

AGSYSMT 3585/HCS 3585

Course subject & number

General Expectations of All Themes

GOAL 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations.

Please briefly identify the ways in which this course represents an advanced study of the focal theme. In this context, "advanced" refers to courses that are e.g., synthetic, rely on research or cutting-edge findings, or deeply engage with the subject matter, among other possibilities. *(50-500 words)*

AGSYSMT 3585/HCS 3585 has a prerequisite of a Foundational Data Analysis course ("HCS 2260, ANIMSCI 2260, or any entry level statistics course approved by the instructor"). AGSYSMT 3585/HCS 3585 course will be using advanced data analysis and interpretation tools in the context of agricultural and food systems. This is accomplished by using software packages such as ArcGIS, R, Excel, SAS, Tableau, and Minitab.

Course subject & number AGSYSMT 3585/HCS 3585

ELO 1.1 Engage in critical and logical thinking about the topic or idea of the theme. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. (50-700 words)

Goals 3-5 and Lab Goals require critical and logical thinking related to sustainable agricultural and food systems. In Goal 3/Lab Goal 3, students will learn and interpret data-driven technologies, and effective ways to visualize and communicate the outcomes of sustainable management of food, fuel, and fiber production, to the workforce and society. In Goal 4/Lab Goal 4, students will understand the economic and environmental benefits of data driven agriculture and food systems for the producer, consumer, and society. In Goal 5 students will understand how data generated from various technologies is collated and analyzed to produce actionable management information (e.g., Enterprise Agriculture) to make agriculture and food systems more sustainable.

ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the topic or idea of the theme. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

Students will gain experience in advanced technologies described in Course Goal 2/Lab Goal 2; for example:
a) (2.1, LLO 2.1) Compare technologies used in data driven agriculture and food systems as they impact sustainability, environmental quality, and society;
b) (2.2, LLO 2.2) precision agriculture technologies (e.g., GNSS, VRT, yield monitoring, and remote sensing) in edge and cloud computing for food, fuel, and fiber production;
c) (2.3, LLO 2.3) geospatial technologies, intelligent networks, RFID, blockchain, data mining, applied IoT, and artificial intelligence used in data driven agriculture and food systems to achieve sustainability and to improve environmental quality;
d) (2.4, LLO 2.4) on-farm research design and protocols that influence sustainability, environmental quality; and
e) (2.5, LLO 2.5) automation of food, fuel, and fiber production, processing, and distribution systems;
f) (2.6) AI is being used in data driven agriculture and food systems to make food, fiber, and fuel production more sustainable;

Course subject & number AGSYSMT 3585/HCS 3585

GOAL 2: Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.

ELO 2.1 Identify, describe, and synthesize approaches or experiences as they apply to the theme. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

Students will draw on their own practical experiences: such as internships, work, or other personal experiences related to their major, and will be able to apply these to interpretation and application of data-driven technologies in the context of sustainable agricultural production. In Course Goal 4 and Lab Goal 4, students will examine how data-driven agriculture and food systems improve profitability while simultaneously improving environmental quality to benefit society. In Course Goal 5, students will model data flow and outputs in enterprise agriculture for their impact on sustainability, environmental quality, and benefits to society.

ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

All students begin the course with some level of understanding of Biobased products such as food, fuel, and fiber; as well as some understanding of environmental issues such as climate, air, water, and nutrient pollution. Goal 4/Lab Goal 4 and the related learning outcome allows students to develop this basic knowledge into formalized, qualitative analysis and interpretation. Students will complete 7 assignments (6 Homeworks and the Technical Feasibility Study), in which they relate and apply their own experiences to the HWK subject matter. Guest lectures are accompanied by a reflective report, which elicits student's views, and critiques the expert's presentation in relation to their impact on them as an individual.

Course subject & number AGSYSMT 3585/HCS 3585

Specific Expectations of Courses in Sustainability

GOAL 1: Students analyze and explain how social and natural systems function, interact, and evolve over time; how human wellbeing depends on these interactions; how actions have impacts on subsequent generations and societies globally; and how human values, behaviors, and institutions impact multi-faceted, potential solutions across time.

1.1 Describe elements of the fundamental dependence of humans on Earth and environmental systems and on the resilience of these systems. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

Goal 2/Lab Goal 2 describes experiences with modern knowledge-based food/fuel/fiber production technologies such as (2.2, LLO 2.2) precision farming, (2.3, LLO 2.3) geospatial technologies, intelligent networks, RFID, blockchain, data mining, applied IoT, 2.6 artificial Intelligence, (2.4, LLO 2.4) on-farm research design and protocols and (2.5, LLO 2.5) automation of agricultural and livestock production. Course materials develop the relationship between these technologies, processing, and distribution systems and sustainability, and their effects on the environment and society.

Course subject & number AGSYSMT 3585/HCS 3585

1.2 Describe, analyze and critique the roles and impacts of human activity and technology on both human society and the natural world, in the past, currently, and in the future. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

Goals 4/Lab Goal 4 and Goal 5: integrate and apply fundamental knowledge (Goal 1/Lab Goal1) and analytical technologies (Goal 2/Lab Goal 2) to quantitative interpretation of the allocation (management) of resources such as plant/animal genetics, fertilizer, crop protection, production practices, etc. within a production system; to optimize the output of food, fuel, and fiber to use at local, national, and international scales.

1.3 Devise informed and meaningful responses to problems and arguments in the area of sustainability based on the interpretation of appropriate evidence and an explicit statement of values. Please link this ELO to the course goals and topics and indicate *specific* activities/assignments through which it will be met. *(50-700 words)*

This course uses modern principles, theories, and methods of data-driven agriculture and food systems (Goal 1/Lab Goal 1) and quantitative technologies (Goal 2, Lab Goal 2) to develop and evaluate informed and meaningful responses to resource allocation (plant/animal genetics, fertilizer, crop protection, production practices, etc.) within a production system (farm) with the objective of sustainable production systems. Sustainability is defined as the ability to produce a product that is efficient and profitable; that minimizes the impact to the land, air, and water; and that enhances the quality of life for local, national, and international communities.

From:	Shearer, Scott A.
To:	Venkatesh, Ramarao; Trefz, Kelvin
Cc:	Barker, David; Gardner, David
Subject:	FW: New Course Concurrence for AGSYSMT/HCS 3585 and 3586
Date:	Monday, December 20, 2021 3:22:48 PM
Attachments:	image001.png image002.png image003.png image004.png

FYI

Regards,
Scott

THE OHIO STATE UNIVERSITY

Scott A. Shearer, PhD, PE | Professor and Chair
Food, Agricultural and Biological Engineering | 200A Agricultural Engineering Building
590 Woody Hayes Drive | Columbus, OH 43210-1058
Office: 614.292.7284 | Mobile: 859.509.5026 | FAX: 614.292.9448
www.fabe.osu.edu | twitter.com/ScottShearer95

first gen OHIO STATE

From: Munroe, Darla <munroe.9@osu.edu>
Sent: Monday, December 20, 2021 1:26 PM
To: Shearer, Scott A. <shearer.95@osu.edu>
Subject: Re: New Course Concurrence for AGSYSMT/HCS 3585 and 3586

Geography is happy to concur.

Darla K. Munroe, PhD
Professor and Chair
Faculty Advisory Board, Sustainability Institute
Editor in Chief, *Journal of Land Use Science*
Scientific Steering Committee, the Global Land Programme

The Ohio State University
College of Arts and Sciences Department of Geography
1036 Derby Hall, 154 North Oval Mall, Columbus, OH 43210
614-247-8382 Office
munroe.9@osu.edu osu.edu
Pronouns: she, her, hers

From: Shearer, Scott A. <shearer.95@osu.edu>
Date: Friday, December 10, 2021 at 9:10 AM

To: Sharp, Jeff <sharp.123@osu.edu>, Haab, Timothy <haab.1@osu.edu>, peffer.1@osu.edu <peffer.1@osu.edu>, Arora, Anish <anish@cse.ohio-state.edu>, Imbert, Dorothee <imbert.4@osu.edu>, Munroe, Darla <munroe.9@osu.edu>, MacKay, Allison A. <mackay.49@osu.edu>
Cc: Barker, David <barker.169@osu.edu>, Karcher, Doug <karcher.3@osu.edu>, Gardner, David <gardner.254@osu.edu>, Chen, Qian <chen.1399@osu.edu>, Venkatesh, Ramarao <venkatesh.1@osu.edu>, Trefz, Kelvin <trefz.1@osu.edu>, Luikart, Meredith <luikart.6@osu.edu>
Subject: New Course Concurrence for AGSYSMT/HCS 3585 and 3586

Jeff, Tim, Pasha, Anish, Dorothee, Darla and Allison:

Please accept this email as a formal request for concurrence on two new courses *AGSYSMT 3585/HCS 3585 - Digital Agriculture* and *AGSYSMT 3586/HCS 3586 - Digital Agriculture Laboratory* to be offered by FABE (Food, Agricultural and Biological Engineering) and HCS (Horticulture & Crop Science) beginning Spring Semester '23 under the new GE curriculum (Sustainability Thematic Course) . Given the technology and analytical focus of this course I feel that it is best to obtain concurrence prior to starting the formal course review process.

Please review the attached syllabi for FABE and HCS and the joint concurrence forms. The syllabi are the same for both course as they are cross-listed. Feel free to contact me if you have questions or need additional information. I want to thank you in advance for your attention to this request. We are working on a tight submission deadline, so early action will be appreciated.

Regards,
Scott

THE OHIO STATE UNIVERSITY

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Office: 614.292.7284 | Mobile: 859.509.5026 | FAX: 614.292.9448
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first gen OHIO STATE

From: Shearer, Scott A.
To: Venkatesh, Ramarao; Trefz, Kelvin
Subject: FW: New Course Concurrence for AGSYSMT/HCS 3585 and 3586
Date: Monday, January 10, 2022 9:04:29 AM
Attachments: image003.png
image004.png
image005.png

FYI

Regards,
Scott

THE OHIO STATE UNIVERSITY

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www.fabe.osu.edu | twitter.com/ScottShearer95

first gen OHIO STATE

From: MacKay, Allison A. <mackay.49@osu.edu>
Sent: Monday, January 10, 2022 8:46 AM
To: Shearer, Scott A. <shearer.95@osu.edu>
Subject: FW: New Course Concurrence for AGSYSMT/HCS 3585 and 3586

Hello Scott,

I am confirming that CEGE provides concurrence for these new course proposals. There were no concerns or suggestions from the CEGE review committee.

-Allison

THE OHIO STATE UNIVERSITY

Allison MacKay, PhD, BCEEM
Professor and Chair
College of Engineering Department of Civil, Environmental and Geodetic Engineering
470C Hitchcock Hall, 2070 Neil Ave, Columbus, OH 43210
614-247-7652 Office
mackay.49@osu.edu
Pronouns: she/her/hers / Honorific: Prof.

From: Shearer, Scott A. <shearer.95@osu.edu>
Sent: Friday, December 10, 2021 9:10 AM
To: Sharp, Jeff <sharp.123@osu.edu>; Haab, Timothy <haab.1@osu.edu>; peffer.1@osu.edu; Arora, Anish <anish@cse.ohio-state.edu>; Imbert, Dorothee <imbert.4@osu.edu>; Munroe, Darla <munroe.9@osu.edu>; MacKay, Allison A. <mackay.49@osu.edu>
Cc: Barker, David <barker.169@osu.edu>; Karcher, Doug <karcher.3@osu.edu>; Gardner, David <gardner.254@osu.edu>; Chen, Qian <chen.1399@osu.edu>; Venkatesh, Ramarao <venkatesh.1@osu.edu>; Trefz, Kelvin <trefz.1@osu.edu>; Luikart, Meredith <luikart.6@osu.edu>
Subject: New Course Concurrence for AGSYSMT/HCS 3585 and 3586

Jeff, Tim, Pasha, Anish, Dorothee, Darla and Allison:

Please accept this email as a formal request for concurrence on two new courses *AGSYSMT 3585/HCS 3585 - Digital Agriculture* and *AGSYSMT 3586/HCS 3586 - Digital Agriculture Laboratory* to be offered by FABE (Food, Agricultural and Biological Engineering) and HCS (Horticulture & Crop Science) beginning Spring Semester '23 under the new GE curriculum (Sustainability Thematic Course) . Given the technology and analytical focus of this course I feel that it is best to obtain concurrence prior to starting the formal course review process.

Please review the attached syllabi for FABE and HCS and the joint concurrence forms. The syllabi are the same for both course as they are cross-listed. Feel free to contact me if you have questions or need additional information. I want to thank you in advance for your attention to this request. We are working on a tight submission deadline, so early action will be appreciated.

Regards,
Scott

THE OHIO STATE UNIVERSITY

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Office: 614.292.7284 | Mobile: 859.509.5026 | FAX: 614.292.9448
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first gen OHIO STATE

Ohio State Department Course Review Concurrence Form

The purpose of this form is to provide a simple system of obtaining departmental reactions to proposed new courses, group studies, study tours, workshop requests, and course changes. A letter may be substituted for this form.

Academic units initiating a request which requires such a reaction should complete Section A of this form and send a copy of the form, course request, and syllabus to each of the academic units that might have related interests in the course. Initiating units should allow at least two weeks for responses.

Academic units receiving this form should response to Section B and return the form to the initiating unit. Overlap of course content and other problems should be resolved by the academic units before forwarding this form and all other accompanying documentation to the Office of Academic Affairs.

A. Information from academic unit *initiating* the request:

Initiating Academic Unit: Food, Agricultural & Biological Engineering and Horticulture & Crop Science Date: 12/10/2021

Registrar's Listing: AGSYSMT 3585 & HCS 3585

Course Number: Level: U ☑ P ☐ G ☐ Credit Hours: 3

Course Title: Digital Agriculture

Type of Request: ☑ New Course ☐ Group Studies ☐ Workshop ☐ Study Tour ☐ Course Change

Academic Unit with related interests asked to review the request (use a separate form for each unit while requesting concurrences from multiple units): Department of Animal Sciences

Date responses are needed: "Dec. 23, 2021 or ASAP to meet OAA new GE course submission deadlines."

B. Information from academic units *reviewing* the request:

☑ The academic unit ***supports*** the proposal
☐ The academic unit ***does not support*** the proposal.
Please explain:

☑ The academic unit suggests:
Perhaps in the future, it may be fitting for Animal Sciences to cross-list this course.

Maurice Eastridge

Signature of Department Chair Signature of Graduate Studies Chair (if applicable)

Trefz, Kelvin

From:	Shearer, Scott A.
Sent:	Friday, December 10, 2021 9:10 AM
To:	Sharp, Jeff; Haab, Timothy; peffer.1@osu.edu; Arora, Anish; Imbert, Dorothee; Munroe, Darla; MacKay, Allison A.
Cc:	Barker, David; Karcher, Doug; Gardner, David; Chen, Qian; Venkatesh, Ramarao; Trefz, Kelvin; Luikart, Meredith
Subject:	New Course Concurrence for AGSYSMT/HCS 3585 and 3586
Attachments:	AGSYSMT_3585_Syllabus.docx; AGSYSMT_3586_Syllabus.docx; HCS_3585_Syllabus.docx; HCS_3586_Syllabus.docx; Course_Review_Concurrence_Form_3585_20211210.pdf; Course_Review_Concurrence_Form_3586_20211210.pdf

Jeff, Tim, Pasha, Anish, Dorothee, Darla and Allison:

Please accept this email as a formal request for concurrence on two new courses *AGSYSMT 3585/HCS 3585 - Digital Agriculture* and *AGSYSMT 3586/HCS 3586 - Digital Agriculture Laboratory* to be offered by FABE (Food, Agricultural and Biological Engineering) and HCS (Horticulture & Crop Science) beginning Spring Semester '23 under the new GE curriculum (Sustainability Thematic Course) . Given the technology and analytical focus of this course I feel that it is best to obtain concurrence prior to starting the formal course review process.

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Regards,
Scott

THE OHIO STATE UNIVERSITY

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590 Woody Hayes Drive | Columbus, OH 43210-1058
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www.fabe.osu.edu | twitter.com/ScottShearer95

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A. Information from academic unit *initiating* the request:

Initiating Academic Unit: Food, Agricultural & Biological Engineering and Horticulture & Crop Science Date: 12/10/2021

Registrar's Listing: AGSYSMT 3585 & HCS 3585

Course Number: Level: U ☑ P ☐ G ☐ Credit Hours: 3

Course Title: Digital Agriculture

Type of Request: ☑ New Course ☐ Group Studies ☐ Workshop ☐ Study Tour ☐ Course Change

Academic Unit with related interests asked to review the request (use a separate form for each unit while requesting concurrences from multiple units):

Date responses are needed: "Dec. 23, 2021 or ASAP to meet OAA new GE course submission deadlines."

B. Information from academic units *reviewing* the request:

☐ The academic unit ***supports*** the proposal
☐ The academic unit ***does not support*** the proposal.
Please explain:

☐ The academic unit suggests:

Signature of Department Chair Signature of Graduate Studies Chair (if applicable)

From:	Imbert, Dorothee
To:	Shearer, Scott A.; Sharp, Jeff; Haab, Timothy; peffer.1@osu.edu; Arora, Anish; Munroe, Darla; MacKay, Allison A.
Cc:	Barker, David; Karcher, Doug; Gardner, David; Chen, Qian; Venkatesh, Ramarao; Trefz, Kelvin; Luikart, Meredith
Subject:	Re: New Course Concurrence for AGSYSMT/HCS 3585 and 3586
Date:	Sunday, December 19, 2021 6:43:33 AM
Attachments:	image001.png image002.png image003.png

Dear Scott,
Thank you for passing these along. I wanted to review your descriptions with faculty in landscape architecture who are better acquainted with this topic than I. Their response was positive though they called attention to the need to consider the ethical dimension of digital agriculture, particularly as it relates to data ownership and access.
Best, Dorothée

Dorothée Imbert
Director
Hubert C. Schmidt '38 Chair
[she/her/hers]

Knowlton School
200A Knowlton Hall, 275 West Woodruff Avenue, Columbus, OH 43210
614-292-4075 Office
imbert.4@osu.edu / knowlton.osu.edu

Knowlton

From: "Shearer, Scott A." <shearer.95@osu.edu>
Date: Friday, 10December2021 at 15:10
To: "Sharp, Jeff" <sharp.123@osu.edu>, "Haab, Timothy" <haab.1@osu.edu>, "peffer.1@osu.edu" <peffer.1@osu.edu>, "Arora, Anish" <anish@cse.ohio-state.edu>, Dorothee Imbert <imbert.4@osu.edu>, "Munroe, Darla" <munroe.9@osu.edu>, "MacKay, Allison A." <mackay.49@osu.edu>
Cc: "Barker, David" <barker.169@osu.edu>, "Karcher, Doug" <karcher.3@osu.edu>, "Gardner, David" <gardner.254@osu.edu>, "Chen, Qian" <chen.1399@osu.edu>, "Venkatesh, Ramarao" <venkatesh.1@osu.edu>, "Trefz, Kelvin" <trefz.1@osu.edu>, "Luikart, Meredith" <luikart.6@osu.edu>
Subject: New Course Concurrence for AGSYSMT/HCS 3585 and 3586

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Regards,
Scott

THE OHIO STATE UNIVERSITY

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first gen OHIO STATE

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A. Information from academic unit *initiating* the request:

Initiating Academic Unit: Food, Agricultural & Biological Engineering and Horticulture & Crop Science Date: 12/10/2021

Registrar's Listing: AGSYSMT 3585 & HCS 3585

Course Number: Level: U ☑ P ☐ G ☐ Credit Hours: 3

Course Title: Digital Agriculture

Type of Request: ☑ New Course ☐ Group Studies ☐ Workshop ☐ Study Tour ☐ Course Change

Academic Unit with related interests asked to review the request (use a separate form for each unit while requesting concurrences from multiple units):

Date responses are needed: "Dec. 23, 2021 or ASAP to meet OAA new GE course submission deadlines."

B. Information from academic units *reviewing* the request:

☐ The academic unit ***supports*** the proposal
☐ The academic unit ***does not support*** the proposal.
Please explain:

☐ The academic unit suggests:

Signature of Department Chair

Academic Affairs Chair
Signature of Graduate Studies Chair (if applicable)

Readings for AGSYSMT-HCS 3585

All textbooks and articles listed here are available free as eBooks or online journals.

- The other books and articles provide supplemental or primary readings on certain topics.
- **[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7
- **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375
- **[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 https://ebooks.ohiolink.edu/viewer/e7ec4ef2-6500-11eb-af00-0a9b31268bf5/1

Recommended/Optional Materials

- **[TRB]** Crawley, M. J. (2013). The R book (Second). Wiley. Retrieved July 21, 2022, https://osu.on.worldcat.org/oclc/809365744 Not referenced.
- **[OAG]** *Ohio Agronomy Guide 15th Edition, Bulletin 472* | *Agronomic Crops Network*. https://agcrops.osu.edu/publications/ohio-agronomy-guide-15th-edition-bulletin-472. Accessed 21 Dec. 2022.
- **[EBS]** *EBarns – Putting Data in Producers' Hands | Ohio BEEF Cattle Letter*. https://u.osu.edu/beef/2022/08/24/ebarns-putting-data-in-producers-hands/. Accessed 21 Dec. 2022.
- **[EFS]** *EFields On-Farm Research* | *Digital Ag*. https://digitalag.osu.edu/efields. Accessed 21 Dec. 2022.

Articles by Sustainability Concepts -additional article may be added in Carmen.

[A-CCS] Carbon cycling and sequestration selected journal articles:

A-CCS-2 Bossio, D. A., Cook-Patton, S. C., Ellis, P. W., Fargione, J., Sanderman, J., Smith, P., . . . Griscom, B. W. (2020). The role of soil carbon in natural climate solutions. Nature Sustainability, 3(5), 391-398. doi:10.1038/s41893-020-0491-z p391 8 pages

A-CCS-3 Chenu, C., Angers, D. A., Barre, P., Derrien, D., Arrouays, D., & Balesdent, J. (2019). Increasing organic stocks in agricultural soils: knowledge gaps and potential innovations. Soil & Tillage Research, 188, 41-52. doi:10.1016/j.still.2018.04.011 p41 11 pages

A-CCS-6 Kopittke, P. M., Menzies, N. W., Wang, P., McKenna, B. A., & Lombi, E. (2019). Soil and the intensification of agriculture for global food security. Environment International, 132, 105078. doi:10.1016/j.envint.2019.105078 p1 7 pages

A-CCS-10 Wiesmeier, M., Urbanski, L., Hobley, E., Lang, B., Lutzow, M. v., Marin-Spiotta, E., . . . Kogel-Knabner, I. (2019). Soil organic carbon storage as a key function of soils - a review of drivers and indicators at various scales. Geoderma, 333, 149-162. doi:10.1016/j.geoderma.2018.07.026 p149 13 pages

[A-WQQ] Water quality and quantity selected journal articles:

A-WQQ-1 Bierkens, M. F. P., & Wada, Y. (2019). Non-renewable groundwater use and groundwater depletion: a review. Environmental Research Letters, 14(6). doi:10.1088/1748-9326/ab1a5f p1 43 pages

Duncan, E. W., Osmond, D. L., Shober, A. L., Starr, L., Tomlinson, P., Kovar, J. L., . . . Reid, K. (2019). Phosphorus and soil health management practices. Agricultural and Environmental Letters, 4(1), 190014. doi:10.2134/ael2019.04.0014 p1 5 pages

Emde, D., Hannam, K. D., Most, I., Nelson, L. M., & Jones, M. D. (2021). Soil organic carbon in irrigated agricultural systems: a meta-analysis. Global Change Biology, 27(16), 3898-3910. doi:10.1111/gcb.15680 p3898 12pages

A-WQQ-4 Liu, J., & Lobb, D. A. (2021). An overview of crop and crop residue management impacts on crop water use and runoff in the Canadian prairies. Water, 13(20). doi:10.3390/w13202929 p1 16 pages

A-WQQ-7 Skaalsveen, K., Ingram, J., & Clarke, L. E. (2019). The effect of no-till farming on the soil functions of water purification and retention in north-western Europe: a literature review. Soil & Tillage Research, 189, 98-109. doi:10.1016/j.still.2019.01.004 p98 18 pages

A-WQQ-9 Souza, R. M. d., Seibert, D., Quesada, H. B., Bassetti, F. d. J., Fagundes-Klen, M. R., & Bergamasco, R. (2020). Occurrence, impacts and general aspects of pesticides in surface water: a review. Process Safety and Environmental Protection, 135, 22-37. doi:10.1016/j.psep.2019.12.035 p22 15 pages

[A-FPO] Food production optimization and efficiency selected journal articles:

A-FPO-4 Ricciardi, V., Mehrabi, Z., Wittman, H., James, D., & Ramankutty, N. (2021). Higher yields and more biodiversity on smaller farms. Nature Sustainability, 4(7), 651-657. doi:10.1038/s41893-021-00699-2 p651 6 pages

A-FPO-5 Rosa-Schleich, J., Loos, J., Musshoff, O., & Tscharntke, T. (2019). Ecological-economic trade-offs of Diversified Farming Systems - a review. Ecological Economics, 160, 251-263. doi:10.1016/j.ecolecon.2019.03.002 p160 12 pages

[A-NPC] Nitrogen and phosphorus cycling and use efficiency selected journal articles:

A-NPC-1 Abbott, L. K., Macdonald, L. M., Wong, M. T. F., Webb, M. J., Jenkins, S. N., & Farrell, M. (2018). Potential roles of biological amendments for profitable grain production - a review. Agriculture, Ecosystems & Environment, 256, 34-50. doi:10.1016/j.agee.2017.12.021 p34 6 pages

A-NPC-2 Barkha, & Ananya, C. (2021). Effect of integrated nutrient management on nutrient use efficiency of major nutrients: a review. Plant Archives, 21(1), 1084-1089. doi:10.51470/PLANTARCHIVES.2021.v21.no1.143 p1084 5pages

A-NPC-3 Carr, P. M., Cavigelli, M. A., Darby, H., Delate, K., Eberly, J. O., Gramig, G. G., . . . Woodley, A. L. (2019). Nutrient cycling in organic field crops in Canada and the United States. Agronomy Journal, 111(6), 2769-2785. doi:10.2134/agronj2019.04.0275 p2769 16 pages

A-NPC-4 Colaco, A. F., & Bramley, R. G. V. (2018). Do crop sensors promote improved nitrogen management in grain crops? Field Crops Research, 218, 126-140. doi:10.1016/j.fcr.2018.01.007 p126 14 pages

A-NPC-5 Duncan, E. G., O'Sullivan, C. A., Roper, M. M., Biggs, J. S., & Peoples, M. B. (2018). Influence of co-application of nitrogen with phosphorus, potassium and sulphur on the apparent efficiency of nitrogen fertiliser use, grain yield and protein content of wheat: review. Field Crops Research, 226, 56-65. doi:10.1016/j.fcr.2018.07.010 p56 9 pages

A-NPC-6 Folina, A., Tataridas, A., Mavroeidis, A., Kousta, A., Katsenios, N., Efthimiadou, A., . . . Kakabouki, I. (2021). Evaluation of various nitrogen indices in N-fertilizers with inhibitors in field crops: a review. Agronomy, 11(3). doi:10.3390/agronomy11030418 p1 25 pages

A-NPC-7 Liu, C., Plaza-Bonilla, D., Coulter, J. A., Kutcher, H. R., Beckie, H. J., Wang, L., . . . Gan, Y. (2022). Diversifying crop rotations enhances agroecosystem services and resilience. Advances in Agronomy, 173, 299-335. doi:10.1016/bs.agron.2022.02.007 p299 36 pages

A-NPC-8 Losacco, D., Ancona, V., Paola, D. d., Tumolo, M., Massarelli, C., Gatto, A., & Uricchio, V. F. (2021). Development of ecological strategies for the recovery of the main nitrogen agricultural pollutants: a review on environmental sustainability in agroecosystems. Sustainability, 13(13). doi:10.3390/su13137163 p1 17 pages

A-NPC-9 Martinez-Dalmau, J., Berbel, J., & Ordonez-Fernandez, R. (2021). Nitrogen fertilization. A review of the risks associated with the inefficiency of its use and policy responses. Sustainability, 13(10). doi:10.3390/su13105625 p1 15 pages

A-NPC-10 Swaney, D. P., & Howarth, R. W. (2019). Phosphorus use efficiency and crop production: patterns of regional variation in the United States, 1987-2012. Science of the Total Environment, 685, 174-188. doi:10.1016/j.scitotenv.2019.05.228 p174 15 pages

A-NPC-13 Wang, Z., & Li, S. (2019). Nitrate N loss by leaching and surface runoff in agricultural land: a global issue (a review). Advances in Agronomy, 156, 159-217. doi: 10.1016/bs.agron.2019.01.007 p159 59 pages

[A-CSA] *Climate-Smart Agriculture selected journal articles:*

A-CSA-1 Barasa, P. M., Botai, C. M., Botai, J. O., & Mabhaudhi, T. (2021). A review of climate-smart agriculture research and applications in Africa. Agronomy, 11(6). doi:10.3390/agronomy11061255 p1 26 pages

A-CSA-2 Gardezi, M., Michael, S., Stock, R., Vij, S., Ogunyiola, A., & Ishtiaque, A. (2022). Prioritizing climate-smart agriculture: an organizational and temporal review. Wiley Interdisciplinary Reviews: Climate Change, 13(2). doi:10.1002/wcc.755 p1 15 pages

A-CSA-3 Mizik, T. (2021). Climate-smart agriculture on small-scale farms: a systematic literature review. Agronomy, 11(6). doi:10.3390/agronomy11061096/ p1 16 pages

A-CSA-4 Sarker, M. N. I., Wu, M., Alam, G. M. M., & Islam, M. S. (2019). Role of climate smart agriculture in promoting sustainable agriculture: a systematic literature review. International Journal of Agricultural Resources, Governance and Ecology, 15(4), 323-337. doi:10.1504/ijarge.2019.104199 p323 15 pages

A-CSA-5 Thornton, P. K., Whitbread, A., Baedeker, T., Cairns, J., Claessens, L., Baethgen, W., . . . Keating, B. (2018). A framework for priority-setting in climate smart agriculture research. Agricultural Systems, 167, 161-175. doi:10.1016/j.agsy.2018.09.009 p161 15 pages

A-CSA-6 Totin, E., Segnon, A. C., Schut, M., Affognon, H., Zougmore, R. B., Rosenstock, T., & Thornton, P. K. (2018). Institutional perspectives of climate-smart agriculture: a systematic literature review. Sustainability, 10(6), 1990. doi:10.3390/su10061990 p1 20 pages

A-CSA-7 Zougmore, R. B., Laderach, P., & Campbell, B. M. (2021). Transforming food systems in Africa under climate change pressure: role of climate-smart agriculture. Sustainability, 13(8). doi:10.3390/su13084305 p2 17 pages

[A-FSY] Food safety selected journal articles:

A-FSY-1 Adeyeye, S. A. O. (2020). Aflatoxigenic fungi and mycotoxins in food: a review. Critical Reviews in Food Science and Nutrition, 60(5), 709-721. doi:10.1080/10408398.2018.1548429 p709 13 pages

A-FSY-2 Anil, P., Navnidhi, C., Neelesh, S., & Sundeep, J. (2018). Role of Food Safety Management Systems in safe food production: a review. Journal of Food Safety, 38(4), e12464. doi:10.1111/jfs.12464 p1 11 pages

A-FSY-3 Chen, H., Kinchla, A. J., Richard, N., Shaw, A., & Feng, Y. (2021). Produce growers' on-farm food safety education: a review. Journal of Food Protection, 84(4), 704-716. doi:10.4315/jfp-20-320 p704 13 pages

A-FSY-4 Duchenne-Moutien, R. A., & Neetoo, H. (2021). Climate change and emerging food safety issues: a review. Journal of Food Protection, 84(11), 1884-1897. doi:10.4315/jfp-21-141 p1884 14 pages

A-FSY-5 Lenzi, A., Marvasi, M., & Baldi, A. (2021). Agronomic practices to limit pre- and post-harvest contamination and proliferation of human pathogenic Enterobacteriaceae in vegetable produce. Food Control, 119. doi:10.1016/j.foodcont.2020.107486 p1 11 pages

A-FSY-6 Riggio, G. M., Wang, Q., Kniel, K. E., & Gibson, K. E. (2019). Microgreens - a review of food safety considerations along the farm to fork continuum. International Journal of Food Microbiology, 290, 76-85. doi:10.1016/j.ijfoodmicro.2018.09.027 p76 10 pages

[A-FOS] *Food security selected journal articles:*

A-FOS-1 Ali, R., Ali, R., Mehmood, S. S., Zou, X., Zhang, X., Lv, Y., & Xu, J. (2019). Impact of climate change on crops adaptation and strategies to tackle its outcome: a review. Plants, 8(2), 34. doi:10.3390/plants8020034 p1 29 pages

A-FOS-2 Karthikeyan, L., Chawla, I., & Mishra, A. K. (2020). A review of remote sensing applications in agriculture for food security: crop growth and yield, irrigation, and crop losses. Journal of Hydrology (Amsterdam), 586. doi:10.1016/j.jhydrol.2020.124905 p1 22 pages

A-FOS-3 Leisner, C. P. (2020). Review: climate change impacts on food security- focus on perennial cropping systems and nutritional value. Plant Science, 293. doi:10.1016/j.plantsci.2020.110412 p1 7 pages

A-FOS-4 Ramankutty, N., Mehrabi, Z., Waha, K., Jarvis, L., Kremen, C., Herrero, M., & Rieseberg, L. H. (2018). Trends in global agricultural land use: Implications for environmental health and food security. Annual Review of Plant Biology, 69, 789-815. doi:10.1146/annurev-arplant-042817-040256 p789 30 pages

A-FOS-5 Wezel, A., Herren, B. G., Kerr, R. B., Barrios, E., Goncalves, A. L. R., & Sinclair, F. (2020). Agroecological principles and elements and their implications for transitioning to sustainable food systems. a review. Agronomy for Sustainable Development, 40(6). doi:10.1007/s13593-020-00646-z p1 13 pages

Readings by lecture

Lec#	Week	Topics	Readings
1	**1**	Introduction to Digital Agriculture and its Role in Sustainability	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 1 – The Agriculture Eras p1 12 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 1 - An Introduction to Precision Agriculture p1 12 pages** **[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 **Chapter 1.2.3 New Sensing Technologies Are the Backbone of Precision Agriculture p1 5 pages**
2	**1**	Global Navigation Satellite Systems (GNSS) in Agriculture and Natural Resource Conservation	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 2 – Global Navigation Satellite Systems p13 14 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 3 - Satellite-based Positioning Systems for Precision Agriculture p1 12 pages**
3	**2**	ArcGIS and Applications in Agricultural Sustainability	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 2 – Spatial and Temporal Variability Analysis p27 17 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 4 - Basics of Geographic Information System p1 16 pages**

Lec#	Week	Topics	Readings
4	**2**	Farm Management Information Systems (FMIS) for Sustainable Management	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 15 – Platforms, Applications, and Software p259 13 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 2 – Understanding and Identify Variability p13 12 pages** **Chapter 4 - Basics of Geographic Information System p1 16 pages** **Chapter 7 - Pest Measurement and Management p93 10 pages** **Chapter 11 - Precision Variable Equipment p155 14 pages** **[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 https://ebooks.ohiolink.edu/viewer/e7ec4ef2-6500-11eb-af00-0a9b31268bf5/1 **Chapter 1.2.5 Robots and Variable Rate Technology p13 1 page** **Chapter 1.4.1 Implementation of Precision Agriculture and Related Challenges p20 1 page** **Chapter 2.2 Crop Sensing Technology p37** **Chapter 2.3 Soil Sensing Technology p39 2 pages** **Chapter 2.4 Root Sensing Technology p41 3 pages** **Chapter 2.6 Examples of Sensing Technologies for Precision Agriculture Applications p44 6 pages** **Chapter 5.6 Optimization of resources p93 3 pages** A-CCS-2 A-CCS-9 A-FPO-4 A-FPO-5

Lec#	Week	Topics	Readings
5	**3**	Variable Rate Technology and its Role in Long-Term Soil Health and Sustainability	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 9 – Control and Automation Systems in Agricultural Machinery p143 14 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 2 – Understanding and Identify Variability p13 12 pages** **Chapter 7 - Pest Measurement and Management p93 10 pages** **Chapter 11 - Precision Variable Equipment p155 14 pages** **[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 https://ebooks.ohiolink.edu/viewer/e7ec4ef2-6500-11eb-af00-0a9b31268bf5/1 **Chapter 1.2.5 Robots and Variable Rate Technology p13 1 pages** **Chapter 1.4.1 Implementation of Precision Agriculture and Related Challenges p20 1 pages** **Chapter 2.2 Crop Sensing Technology p37 1 pages** **Chapter 2.3 Soil Sensing Technology p39 3 pages** **Chapter 2.4 Root Sensing Technology p41 3 pages** **Chapter 2.6 Examples of Sensing Technologies for Precision Agriculture Applications p44 6 pages** A-CCS-3 A-CCS-6 A-WQQ-4 A-WQQ-7 A-WQQ-9 A-FPO-4 A-FPO-5

Lec#	Week	Topics	Readings
6	**3**	Soil Health Soil Sampling and Soil Sensing	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 6 – Sampling and Interpretation of Maps p143 14 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 6 - Soil Variability and Fertility Management p81 19 pages** **[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 https://ebooks.ohiolink.edu/viewer/e7ec4ef2-6500-11eb-af00-0a9b31268bf5/1 **Chapter 3.2 Why Does Soil Fertility Matter? p57 1 pages** **Chapter 3.3.1 Principles Guiding Fertilizer Use in Nutrient-Deficient Soils p60 1 page** **Chapter 3.4.1 Observations About Nutrient-Excessive Soils p61 3 pages** **Chapter 3.5 Precision Agriculture, a Smart System for Soil Nutrient Management p54 8 pages** **Chapter 4.4 Ecological Aspects (Nitrogen Use Efficiency, Nmin) p76 1 page** **Chapter 5.7 Unforeseen Consequences (Weed Increases, Labor Decreases, Workforce Education) p96 4 pages** **[EFS]** *EFields On-Farm Research	Digital Ag*. https://digitalag.osu.edu/efields. Accessed 21 Dec. 2022. **Chapter Soil Health Survey Across Ohio Farms p274 2 pages** A-CCS-6 A-CCS-10 A-WQQ-4 A-WQQ-9
7	**4**	Yield Monitoring Technologies for Optimal Resource Management	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 8 – Sensors and Actuators p123 19 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chap 5 – Yield Monitoring and Mapping p63 13 pages**
8	**4**	Historical Yield Data and its Implications for Sustainability	**[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 12 - Precision Agriculture Data Management p169 20 pages**
9	**5**	Artificial Intelligence Primer	The instructors will provide copies of current articles.

Lec#	Week	Topics	Readings
10	**5**	Artificial Intelligence and Crop Care	The instructors will provide copies of current articles.
11	**6**	Controller Area Networks (CAN) and Connected Machines	**[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 10 - Electronics and Control Systems p169 20 pages**
12	**6**	The Ethics of Data Ownership, Aggregation, and Cloud Computing	**[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 https://ebooks.ohiolink.edu/viewer/e7ec4ef2-6500-11eb-af00-0a9b31268bf5/1 **Chapter 1.2.4 Data Mining and Precision Agriculture p12 1 page**
13	**7**	Google Earth Applications in Production and Urban Agriculture	The instructors will provide copies of current articles.
14	**7**	Remote Sensing and Applications in Sustainable Agriculture	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 4 - Images and Remote Sensing Applied to Agricultural Management p45 13 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 8 - Remote Sensing for Site-Specific Plant Management p169 20 pages** **Chapter 9 - Proximal Soil and Crop Sensing p119 22 pages**
15	**8**	Drone Applications in Sustainable Agriculture	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 7 - Application of Drones in Agriculture p99 23 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 9 - Proximal Soil and Crop Sensing p119 22 pages**
16	**8**	Precision Conservation Management	A-CCS-2 A-WQQ-4
17	**9**	Controlled Environment Agriculture	A-CCS-2
18	**9**	Tracking Weather and Climate Change	The instructors will provide copies of current articles.
	10	Spring Break	
	10	Spring Break	

Lec#	Week	Topics	Readings
19	**11**	Precision Livestock Farming Systems	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 11 - Application of Drones in Agriculture p173 20 pages** **[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 https://ebooks.ohiolink.edu/viewer/e7ec4ef2-6500-11eb-af00-0a9b31268bf5/1 **Chapter 1.2.7 Breeding and Precision Agriculture p15 1 page** **Chapter 1.3 Precision Agriculture in Animal Production: Enabling Technologies and Applications p15 1 page** **Chapter 1.3.1 Cattle and Sheep PLF Applications p17 2 pages** **Chapter 1.3.2 Swine p18 1 page** **Chapter 1.3.3 Poultry p19 1 page** **Chapter 9.2 Automated Monitoring of Feeding and Drinking Patterns in Growing-Finishing Pigs p183 4 pages** **Chapter 9.3 Toward a Warning System for Performance, Health, and Welfare Problems in Individual Pigs p187 3 pages**
20	**11**	Managing Pasture Based Livestock Systems	A-FPO-4 A-FPO-5
21	**12**	Crop and Animal Modeling	A-FPO-4
22	**12**	Precision Irrigation and Controlled Drainage for Enhance Water Quality	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 10 - Digital Irrigation p157 25 pages** **[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 https://ebooks.ohiolink.edu/viewer/e7ec4ef2-6500-11eb-af00-0a9b31268bf5/1 **Chapter 6.1 Introduction 1086.2 Precision Irrigation p110 2 pages** **Chapter 6.2.1 Environmental Factors in the Field Crops p111 1 page** **Chapter 6.2.2 Wireless Communication Technologies p113 1 page** A-FPO-5 A-WQQ-1
23	**13**	Internet of Things (IoT) and Sustainability	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 12 Internet of Things in Agriculture p 195 26 pages**

Lec#	Week	Topics	Readings
24	**13**	On-Farm Research and its role in Digital Agriculture.	**[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 13 - On-Farm Replicated Strip Trials p189 20 pages** A-CCS-6 A-FPO-4 A-FPO-5
25	**14**	Data Analytics and Visualization for Digital Agriculture	**[DAS]** Marçal de Queiroz, Daniel, et al., editors. *Digital Agriculture*. Springer, 2022. https://library.ohio-state.edu/record=b10547384~S7 **Chapter 1 - Data Transmission, Cloud Computing, and Big Data p 195 26 pages** **[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 13 - Precision Agriculture Data Management p169 20 pages** **[WPA]** Hamrita, T. K. (Ed.). (2021). Women in precision agriculture: technological breakthroughs, challenges and aspirations for a prosperous and sustainable future (Ser. Women in engineering and science). Springer. https://osu.on.worldcat.org/oclc/1187169922 https://ebooks.ohiolink.edu/viewer/e7ec4ef2-6500-11eb-af00-0a9b31268bf5/1 **Chapter 1.2.4 Data Mining and Precision Agriculture p12 1 page**
26	**14**	AI in Marketing and Agricultural Supply Chain Logistics	The instructors will provide copies of current articles.
27	**15**	Application of Blockchain Technology in Agricultural Supply Chain	The instructors will provide copies of current articles.
28	**15**	Enterprise Agriculture and Sustainability	**[PAB]** Shannon, D. K., Clay, D., and Kitchen, N. R. (Eds.). (2018). Precision agriculture basics. American Society of Agronomy. https://osu.on.worldcat.org/oclc/1037150375 **Chapter 14 - Environmental Implications of Precision Agriculture p209 12 pages** **Chapter 15 - Economics of Precision Farming p221 12 pages** A-WQQ-4
		Finals	