

Term Information

Effective Term Autumn 2022
[Previous Value](#) Autumn 2018

Course Change Information

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

This course is being restructured. Changes to the subject area, course title, course description, credit hours, course goals, and content topics are being proposed.

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

This course is being restructured to be part of the Sustainability Theme as an Interdisciplinary Team Taught Course. As a result, changes to the subject area, course title, credit hours, course topics, and learning outcomes are being proposed.

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

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

The change to credit hours may affect the FABE program.

Is approval of the request contingent upon the approval of other course or curricular program request? Yes

Please identify the pending request and explain its relationship to the proposed changes(s) for this course (e.g. cross listed courses, new or revised program)

The course is cross-listed with FST; they are processing their course change request. The course is also a required course for the new FST program curriculum, which will be submitted in November.

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area Previous Value	Food, Agricul & Bio Engineer 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	3400
Course Title Previous Value	Sustainability of the Food Supply Chain Food Supply-Chain Equipment Operations
Transcript Abbreviation Previous Value	Sustain Food Supp Food Chain Eq Op
Course Description Previous Value	Sustainability of the food supply chain depends on the efficiency of transforming raw food materials into consumer food products. This course introduces key operations in each sector of the supply chain along with sustainability parameters, focusing on energy, water, and waste. Students will recognize the challenges of maintaining a sustainable food supply while minimizing environmental impact. <i>The focus of this course is description of equipment used throughout the food supply chain from harvest/assembly to preparation for consumption. After completing this course, students will recognize how equipment systems are assembled within a facility and the role of sensing and control systems in operation of facilities for handling, manufacturing, storage, distribution and preparation of foods.</i>
Semester Credit Hours/Units Previous Value	Fixed: 4 Fixed: 2

Offering Information

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

Prerequisites and Exclusions

Prerequisites/Corequisites	
Exclusions	Not open to students with credit for FDSCTE 3400
Previous Value	
Electronically Enforced	Yes
Previous Value	No

Cross-Listings

Cross-Listings	FDSCTE 3400
Previous Value	Cross-listed in FdScTe.

Subject/CIP Code

Subject/CIP Code	14.0301
Previous Value	01.1001
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

[Previous Value](#)

[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

- Recognize critical operations within the food supply system for handling, preservation, storage, transportation, and preparation of safe and high-quality foods.
- Understand and interpret the quantitative measures of sustainability as defined in Life-Cycle-Assessment (LCA) and applied to the food supply system.
- Gain experience with the interpretation of sustainability parameters for food products, as influenced by specific operations or sector of the food supply system.
- Recognize the importance of energy efficiency, water reclamation, and food waste management to sustainability of a safe and high-quality food supply.

Previous Value

- *Gain recognition of major equipment systems required for safe and sanitary handling, preservation, storage and transport of foods between harvest or assembly and final preparation for consumption.*
- *Understand the operating mechanisms of primary equipment systems used in the transformation of raw food materials into safe and high-quality food products.*
- *Develop an understanding of the equipment systems needed and the configuration of equipment components needed to manufacture consumer food products.*
- *Appreciate the importance of sensors, instrumentation and control systems required for efficient operation of facilities for transport, storage, manufacture and distribute high-quality and safe food products.*
- *Understand the importance of sanitary design of all food contact surfaces in equipment used throughout the food supply chain.*

Content Topic List

- Introduction to the food supply system.
- The role of preservation in a sustainable food supply system.
- An introduction to sustainability parameters; use of Life-Cycle Assessment (LCA) to quantify impacts of industrial operations on natural resource and the environment.
- The role of sanitation in the food supply system; the importance of sanitary design of food contact surfaces. The role of regulatory agencies in ensuring a safe food supply.
- Handling and storage operations for raw food materials and ingredients; the use of water for washing of fruits and vegetables prior to fresh produce marketing.
- The role of refrigeration in the food supply system; maintaining food quality and extending the shelf-life of food products.
- The role of heat exchangers in ensuring maximum thermal energy efficiency, including description of typical heat exchangers (conduction, convection, radiation, microwave) used throughout the food supply system.
- The use of thermal energy for preservation and preparation of food; extending shelf-life of a product by elevating the temperature to inactivate spoilage microorganisms and pathogens.
- The frozen food supply system; the operations required to remove thermal energy from food during the manufacturing of frozen foods, the energy requirements for transportation and low-temperature storage of a frozen food, including storage in the home
- The concentration and drying of food products and ingredients; the removal of water to reduce volume for storage and distribution of the product or ingredient.
- The manufacturing of liquid food ingredients; an introduction to the operations used for mechanical separation and the membrane technologies for refined separation for liquid food ingredients.
- The operations involving the extraction of food ingredients from solid raw materials; the grinding of grain for flour manufacturing; the extraction of oil from oil seeds.
- The packaging and containers used for food products and ingredients throughout the food supply system; packaging/container materials for liquid and solid foods.
- Cleaning and sanitation throughout the food supply system; an introduction to the materials and operations required to ensure a safe food supply.
- Cleaning and sanitation equipment; presentation of key components of cleaning systems for food contact surfaces; introduction to control systems for ensuring that in-place cleaning is accomplished in an efficient and effective manner.

Previous Value

- *Intro to the food supply chain; understanding the scope of the supply chain and the important role of equipment in meeting the demands of converting raw food materials into safe, high quality consumer products in an effective and efficient manner.*
- *Basic principles of equipment design to ensure that food contact surfaces meet industry standard; both voluntary (3A, etc.) and from regulatory agencies. Understanding that sanitary design applies to facilities as well as equipment.*
- *Materials handling equipment for raw food materials; washing fruits and vegetables in the field, bulk transportation of liquids (including pumps for liquid transport), slaughter house equipment for meat products, drying, storage and grain handling.*
- *Heat exchanges; a descriptive review of heat exchangers used throughout the food supply chain; from refrigeration condensers to plate heat exchangers for liquids to heating/cooling of solid foods (convection, microwave, infrared) to cooking in oil.*
- *Refrigeration; an introduction to the primary components of refrigeration systems, with emphasis on recognizing system components in large scale systems for refrigerated warehouses as well as appliances in the kitchen or food service establishments.*
- *Equipment for food preservation and preparation, including blanching solid materials, pasteurization of liquid foods, UHT for aseptic products and retorts for canned foods; including an intro to equipment for non-thermal preservation methods.*
- *Food freezing and frozen food storage; a review of food freezing equipment, from continuous freezing systems to IQF using cryogenic refrigerants to cold air blast tunnels to plate freezers and other methods used to accelerate freezing of foods.*
- *Concentration of liquid foods; a description of thermal evaporation systems, from single- effect evaporators to multiple-effect systems for efficient removal of water and concentration of product solids; an intro to non-thermal concentration methods.*
- *Separation and mixing systems; a description of various types of equipment used to separate liquid foods into components, from milk separators to membrane systems for separation; equipment for mixing, blending and agitation of liquids.*
- *Food dehydration; a review of the range of drying systems used for food products, from basic cabinet dryers to spray dryers for liquid foods. Equipment used for manufacturing of bakery products will be presented and described.*
- *Extraction equipment; an array of different types of equipment used for extraction of components from food materials will be described; including grinding steps for flour products and extraction of oil from oil seeds.*
- *Extrusion equipment; description of various types of extrusion equipment, from single-screw to double-screw; and with an emphasis on understanding the role of the equipment on characteristics of products produced.*
- *Packaging equipment; a review of the range of filling equipment used for liquid foods and for placement of solid food in containers; specific attention to the unique requirements for aseptic filling and similar systems.*
- *Storage and distribution; a review of materials handling equipment for shelf-stable foods during transportation and distribution, including unique types of transportation vehicles and materials handling in warehouses.*
- *Cleaning and sanitation equipment; presentation of key components of cleaning systems for food contact surfaces; introduction to control systems for ensuring that in-place cleaning is accomplished in an efficient and effective manner.*

Sought Concurrence

Yes

Previous Value

No

Attachments

- ASC_Ohio_State_Course_Review_Concurrence_Form - FDSCTE 3400 signed.pdf: ASC Concurrence
(Concurrence. Owner: Heldman, Dennis Ray)
- FW_Concurrence Request for FDSCTE 3400.pdf: Concurrence
(Concurrence. Owner: Heldman, Dennis Ray)
- FW_Concurrence Request for FDSCTE 3400_2.pdf: Concurrence
(Concurrence. Owner: Heldman, Dennis Ray)
- SENR_Ohio_State_Course_Review_Concurrence_Form_SENR.pdf: SENR Concurrence
(Concurrence. Owner: Heldman, Dennis Ray)
- RE_Concurrence Requested for Course Change - FDSCTE 3400, Sustainability of the Food Supply Chain.pdf: FCB Concurrence
(Concurrence. Owner: Heldman, Dennis Ray)
- 3400 submission-sustainability_1-17-22.pdf: Sustainability Theme
(Other Supporting Documentation. Owner: Heldman, Dennis Ray)
- 3400 interdisciplinary-team-taught-inventory_1-17-22.pdf: Team Taught Inventory
(Other Supporting Documentation. Owner: Heldman, Dennis Ray)
- FDSCTE-FABE 3400 Responses to ASC Panel Recommendations.docx: Cover Letter
(Cover Letter. Owner: Heldman, Dennis Ray)
- FDSCTE3400SustainabilitySyllFinal_5-20-22.docx: Syllabus
(Syllabus. Owner: Heldman, Dennis Ray)

Comments

- Revised as per Panel feedback email sent 5/17/2022 *(by Heldman, Dennis Ray on 05/20/2022 02:58 PM)*
- Please see Panel feedback email sent 05/17/2022. *(by Hilty, Michael on 05/17/2022 04:39 PM)*
- Revise as per COAA via email message 21 February 2022

Revise as per email message 22 November 2021 *(by Osborne, Jeanne Marie on 02/24/2022 12:04 PM)*

- Note: This course is an elective or service course for all units except FST.

Jeanne: Please advise if this course with FABE number needs an ad-hoc approver from CoE. *(by Chen, Qian on 11/19/2021 05:47 PM)*

COURSE CHANGE REQUEST
3400 - Status: PENDING

Last Updated: Osborne, Jeanne Marie
05/23/2022

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Heldman, Dennis Ray	11/17/2021 11:38 AM	Submitted for Approval
Approved	Chen, Qian	11/19/2021 05:47 PM	Unit Approval
Revision Requested	Osborne, Jeanne Marie	11/22/2021 09:34 AM	College Approval
Submitted	Heldman, Dennis Ray	01/12/2022 01:15 PM	Submitted for Approval
Approved	Chen, Qian	01/13/2022 01:03 AM	Unit Approval
Revision Requested	Quinzon-Bonello, Rosario	01/18/2022 09:55 AM	Ad-Hoc Approval
Submitted	Heldman, Dennis Ray	01/19/2022 10:54 AM	Submitted for Approval
Approved	Chen, Qian	01/20/2022 04:13 AM	Unit Approval
Approved	Quinzon-Bonello, Rosario	02/24/2022 08:36 AM	Ad-Hoc Approval
Revision Requested	Osborne, Jeanne Marie	02/24/2022 12:04 PM	College Approval
Submitted	Heldman, Dennis Ray	02/25/2022 08:21 AM	Submitted for Approval
Approved	Chen, Qian	02/25/2022 11:47 AM	Unit Approval
Approved	Quinzon-Bonello, Rosario	02/25/2022 12:35 PM	Ad-Hoc Approval
Approved	Osborne, Jeanne Marie	02/28/2022 12:03 PM	College Approval
Revision Requested	Hilty, Michael	05/17/2022 04:39 PM	ASCCAO Approval
Submitted	Heldman, Dennis Ray	05/20/2022 04:57 PM	Submitted for Approval
Approved	Chen, Qian	05/21/2022 12:24 PM	Unit Approval
Approved	Quinzon-Bonello, Rosario	05/23/2022 10:27 AM	Ad-Hoc Approval
Approved	Osborne, Jeanne Marie	05/23/2022 11:38 AM	College Approval
Pending Approval	Cody, Emily Kathryn Jenkins, Mary Ellen Bigler Hanlin, Deborah Kay Hilty, Michael Vankeerbergen, Bernadette Chantal Steele, Rachel Lea	05/23/2022 11:38 AM	ASCCAO Approval

May 20, 2022

Dear ASC Curriculum Committee,

We thank the Themes Panel of the ASC Curriculum Committee for reviewing FDSCTE/FABE 3400 – Sustainability of the Food Supply System. The panel listed one item that they would like us to address. Below we list the actions (**shown in green font**) that we took to address this concern.

Based on the panel's recommendations, we revised the syllabus for FDSCTE/FABE 3400. We believe that we have adequately addressed all the committee's feedback with this syllabus update. If the committee has additional concerns or questions, please let us know so we can keep working on these items until the committee is fully satisfied.

Sincerely,

Department of Food Science and Technology

Good afternoon,

On Friday, April 29th, the Themes Panel of the ASC Curriculum Committee reviewed a new GE Theme: Sustainability and High Impact Practice: Interdisciplinary Team-Teaching proposal for Food Science and Technology/FABE 3400. Please see below for the feedback of the Panel.

- GE Theme: Sustainability was unanimously approved with one comment:
 - **Comment:** The reviewing faculty found this proposal to be well-crafted and well-organized and clearly suited for the GE Theme: Sustainability. **Thank you.**
- High Impact Practice: Interdisciplinary Team-Teaching was not voted on as the Panel would like the following feedback items addressed:
 - The reviewing faculty request additional information on the team-teaching aspect of the course and how the different faculty members teaching bring a different perspective to the course that helps explain the interdisciplinary nature of the instruction. **In response to this feedback, we added a section "Faculty Team and Expertise" on pages 4-6 in the syllabus. In this section, we detail the different disciplines covered in this course, the specific lecture topics taught by each faculty member, and the specific expertise and disciplinary perspectives each faculty member brings to this course. These revisions give a clearer picture of the interdisciplinary nature of the instruction.**
 - The reviewing faculty ask that a cover letter be provided that details all changes made in response to the feedback of the Panel. **Letter provided here.**

Sustainability of the Food Supply Chain: Syllabus

FDSCTE/FABE 3400 Autumn 2022

Course Information

- **Course times and location:** Two 55-min lectures; two 2-hr laboratory sessions
- **Credit hours:** 4
- **Mode of delivery:** In person

Instructors

Department of Food Science & Technology:

Dennis R. Heldman
Email: heldman.20@osu.edu
Phone: 614-292-5899
229 Parker Food Science and Technology Building
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Valente Alvarez
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140 Howlett Hall
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V.M. Balasubramaniam
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333 Parker Food Science and Technology Building
Office hours: TBD

Rafael Jimenez-Flores
Email: jimenez-flores.1@osu.edu
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329 Parker Food Science and Technology Building
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Department of Food, Agricultural and Biological Engineering:

Ajay Shah
Email: shah.971@osu.edu
Phone: 330-263-3858
110 FABE
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**.



Teaching Assistant

- TBD

Course Prerequisites

None

Course Description

Sustainability of the food supply chain depends on the efficiency of transforming raw food materials into consumer food products. This course introduces key operations in each sector of the supply chain along with sustainability parameters, focusing on energy, water, and waste. Students will recognize the challenges of maintaining a sustainable food supply while minimizing environmental impact.

Learning Outcomes

On completion of this course, students will:

- Recognize critical operations within the food supply chain for handling, preservation, storage, transportation, and preparation of safe and high-quality foods.
- Understand and interpret the quantitative measures of sustainability as defined in Life-Cycle-Assessment (LCA) and applied to the food supply chain.
- Gain experience with the interpretation of sustainability parameters for food products, as influenced by specific operations or sector of the food supply chain.
- Recognize the importance of energy efficiency, water reclamation, and food waste management to sustainability of a safe and high-quality food chain.

General Education Expected Learning Outcomes

As part of the Sustainability theme of the General Education curriculum, this course is designed to prepare students to:

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

ELO 1.1 Engage in critical and logical thinking about the topic or idea of sustainability.

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

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.



2.1 Identify, describe, and synthesize approaches or experiences as they apply to sustainability.

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.

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.

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

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.

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.

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, assignments, and reports with a focus on sustainability and the food supply. The first two assignments and reports will require the students to study and understand the food supply chain, and the role of food production, preservation, packaging, storage, distribution, retail marketing, and final preparation in delivery of safe and high-quality food products to consumers.
- Engaging in an advanced, in-depth, and scholarly exploration through a semester-long study of the specific operations, processes, and equipment required to manufacture and deliver a specific food product selected by the student.
- Identifying, describing, and synthesizing approaches or experiences as the student develops sustainability metrics to the food product selected. A series of exercises will be completed leading to quantification of the total sustainability metric for the product, as well as the contribution of each operation and process.
- Demonstrating 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. Throughout the semester project, students will be provided with opportunities to interact with other students to share observations about the operations and processes for their specific food product and learn about the differences in operations and processes for other products. These exchanges will include comparisons of the sustainability metrics and the contribution of specific operations and processes to the total sustainability metric for each food product. These interactions will allow students to build on their knowledge throughout the semester.
- Describing elements of the fundamental dependence of humans on Earth and environmental systems, and on the resilience of these systems through early lectures



and discussions emphasizing the demand for food by an increasing world population and the decreasing supply of natural resources needed to sustain the supply of food, along with the impacts of sustaining the food supply on quality of the environment.

- Describing, analyzing, and critiquing the roles and impacts of human activity and technology on both human society and the natural world through an evaluation of the delicate balance between an adequate food supply for a growing population and the natural resources required to meet these demands in the future.
- Devising informed and meaningful responses to problems and arguments in sustainability based on the interpretation of appropriate evidence and an explicit statement of values. Knowledge gained will provide students with the understanding required to evaluate the sustainability metrics displayed on packages of food products. The experiences from the course will allow the student to make informed decisions about the selection of food products based on sustainability, as well as the other factors associated with the quality and safety of a food product.

Faculty Team and Expertise

Sustainability of the food supply chain is a complex issue that depends on the efficiency of transforming raw food materials into consumer food products. This course introduces key operations in each sector of the supply chain along with sustainability parameters, focusing on energy, water, and waste. Students will examine these issues from multiple disciplinary perspectives, including the microbiology, chemistry, and physics as applied to food. They will also explore the applications of those disciplines to the manufacturing, storage, transportation, and preparation of food, and their implications for process design, food safety, and food quality. On completion of the course, students will recognize and understand the challenges of maintaining a sustainable food supply, while minimizing the impact of the food supply chain on the environment.

The topics that will be covered and the faculty experts teaching those sections include:

- A. The introduction to the course will be handled by **Dr. Heldman (FST, FABE)** and will focus on a description of the food supply chain from production of raw materials and ingredients to the preparation of food for consumption. Dr. Heldman brings the physics discipline and its application to process design to the faculty team. He will continue to be involved throughout the course, with specific contributions on the importance of refrigeration throughout the food supply chain, as well as the role of frozen foods.
- B. The concepts of Life-Cycle Assessment (LCA) will be presented very early in the course by **Dr. Shah (FABE)**. LCA will be covered from the physics and mathematics disciplines to give a deeper understanding of a product's environmental impact and sustainability. The metrics of LCA will be used to evaluate the contributions of different sectors of the food supply chain to sustainability. Dr. Shah will have an important role throughout the course as the LCA metrics for different foods are developed and evaluated.
- C. The introduction to food preservation processes will be presented by **Dr. Alvarez (FST)** and emphasize the importance of sanitation. Dr. Alvarez approaches these topics from the microbiology discipline with a food safety perspective. Dr. Alvarez will also discuss food safety through a policy lens, covering the role of regulatory agencies in ensuring



safety of the food supply. These presentations will include descriptions of handling and storage of raw food materials and ingredients, as well as the role and importance of packaging to ensure safety and quality of the food supply.

- D. The importance of thermal energy for heating and cooling of foods will be discussed by **Dr. Balasubramaniam (FST, FABE)** and will include the applications of thermal energy for preservation and preparation of food from the physics discipline and will cover its applications to food engineering and process design. The importance of preservation processes on extending the shelf-life of foods will be emphasized from the food safety lens.
- E. The important role of liquid foods and beverages will be presented by **Dr. Jimenez-Flores (FST)**. These segments of the course will include descriptions of separation, extraction, and blending as processes during the manufacturing of most foods, and with specific emphasis on manufacturing of concentrated and dry food products. Dr. Jimenez-Flores will focus on the chemistry discipline with an emphasis on food quality.
- F. Assignments on application of LCA metrics will occur on a weekly basis as the students are introduced to each segment of the food supply chain. **Dr. Shah (FABE)** will be involved in the development and evaluation of these assignments while collaborating with the faculty associated with presentation of the specific segment.

Our interdisciplinary faculty team includes experts from multiple disciplines:

Faculty Member, Department	Disciplinary Perspective	Relevant Areas of Expertise
Dr. Dennis R. Heldman, FST and FABE	Applications of physics and mathematics to food engineering	Significant academic, industrial, and consulting experience with the entire food supply chain with emphasis on process design to achieve maximum efficiency and optimum food product quality. Most recent focus on reducing energy, water, and waste during transformation of raw materials and ingredient into high quality food products.
Dr. Valente Alvarez, FST and Food Industry Center	Applications of microbiology to food safety	Extensive experience in food and dairy processing plant operation, management, and quality assurance. Present focus areas are in industry-related research projects on food technologies, product development, ingredient functionality, product quality, and shelf life. Lead instructor of the



		food industry training courses BPCS, FSPCA-QI, FSVP-QI, HACCP and GMPs.
Dr. V.M. Balasubramaniam, FST and FABE	Applications of physics to food engineering and process design with an emphasis on food safety	Three decades of research experience in process design and development of novel thermal and nonthermal food process technologies with the objective of ensuring food safety, while preserving product quality and nutrition. Translation and application of research knowledge for academic and industrial outreach via classroom instruction, pilot plant demonstrations, webinars, and short courses.
Dr. Rafael Jimenez- Flores, FST and Endowed Chair of Dairy Products	Applications of chemistry to food processing and quality	Thirty year of teaching food and dairy processing courses to undergraduate and graduate students, and short courses to industry and research in dairy foods processing, dairy chemistry, and biochemistry. Practical applications of food processing equipment, instruction on processing operation in dairy pilot and commercial plants. Research and publications in the area of dairy processing and dairy science.
Dr. Ajay Shah, FABE	Applications of physics and mathematics to life cycle assessment	Significant research experience with assessing the sustainability of different biobased and agricultural systems across their value chain from crop production to conversion to the end-products (food, feed, fiber, and fuels), and waste utilization.

How This Course Works

Mode of delivery: This course is in person. Two lecture sessions per week will be delivered in person. Two 120-min laboratory sessions will be required.

Credit hours and work expectations: This is a 4-credit-hour course. According to [Ohio State bylaws on instruction](https://go.osu.edu/credit-hours) (go.osu.edu/credit hours), students should expect around 6 hours per week of time spent on direct instruction in lecture and laboratory sessions, in addition to 6 hours of homework to receive a grade of C average.

Attendance and participation requirements: The following are the expectations for students enrolled in this course:

- **Attend lectures and study materials presented**
Students are expected to attend the lectures and study information presented during these two lectures each week.
- **Participate in two 120-min laboratory sessions per week.**
Participation in two laboratory sessions per week will be critical to understanding concepts to be presented and discussed. Information presented during lectures and discussed during laboratory sessions will provide background for a report due on Monday of the following week.
- **If you are unable to attend** a lecture or laboratory session, please contact Dr. Heldman by email as soon as possible.



Course Materials, Fees, and Technologies

Required Materials and/or Technologies

All readings will be provided through Carmen. These reading materials will be utilized as background literature in the Weekly Reports. See the Course Schedule for additional details.

- Bevilacqua, M., M. Braglia, G. Carmignani and F.A. Zammori. 2007. Life cycle Assessment for pasta production in Italy. *J.Food Quality* 30(6), 932-952.
- Canning, P., Ainsley, C., Huang, S., Polenske, K.R., Walters, A., 2010. Energy use in the U.S. Food System. USDA-ERS Report #94. Washington, DC.
- Cacurachi, S., Scherer, L., Guinee, J., Tukker, A., 2019. Life cycle assessment of food systems. *One Earth*. 1(3), 292-297.
- Fellows, P.J. 2016. *Food Processing Technology; Principles and Practice*. Fourth Edition. Woodhead Publishing. ISBN: 9780081019078. 1152 pp.
- Gleick, Peter H., Palaniappan, M., 2010. Peak water limits to freshwater withdrawal and use. *Proceedings National Academy Science*. 107(25), 11155-11162.
- Heller, M.C., Koeleian, G.A., 2000. Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System. The Center for Sustainable Systems, Report no. CSS00-04. University of Michigan.
- Heller, M.C., Koeleian, G.A., 2003. Assessing the sustainability of the U.S. food system: a life cycle perspective. *Agric. Syst.* 76, 1007-1041.
- Leib E.B., Gunders, D., 2013. The Dating Game: How Confusing Food Date Labels Lead to Food Waste in America. National Resources Defense Council. Washington, DC
- Lundie, S. Peters, G.M., 2005. Life cycle assessment of food waste management options. *J. of Cleaner Production*. 13(3), 275-286.
- McCarthy, D., Matopoulos, A., Davis, P., 2015. Life cycle assessment in the food supply chain: A case study. *Int Journal of Logistics: research and applications*. 18(2), 140-154.
- Mogensen, L., Hermansen, J., Halberg, N., Dalgaard, R., Vis, J., Smith, B. 2012. Life cycle assessment across the food supply chain. Chapter 5 (pp 115-144) in *Sustainability in the Food Industry* (Cheryl Baldwin, Editor). Wiley-Blackwell. ISBN:9780813808468.
- Morawicki, R.O. 2012. *Handbook of Sustainability in the Food Sciences*. John Wiley & Sons. Hoboken, NJ.



- National Research Council, 2015. *A Framework for Assessing Effects of the Food System*. Washington, DC: The National Academies Press.
- Ridoutt, B.G., Huang, J., 2012. Environmental relevance--the key to understanding water footprints. *Proc Natl Acad Sci U S A* 109, E1424.
- Ridoutt, B.G., Pfister, S., 2010. A revised approach to water foot-printing to make transparent the impacts of consumption and production on global freshwater scarcity. *Global Environ. Change*. 20(1), 113-120. (doi:10.1016/j.gloenvcha.2009.08.003)
- Tassou, Savvas A., 2014. Energy demand and reduction opportunities in the UK food chain. *Proceeding of the Institute of Civil Engineers – Energy*. 167(3), 162-170.
- Uhlin, Hans-Erik., 1997. Why Energy Productivity is Increasing: An I-O Analysis of Swedish Agriculture. *Agricultural Systems*. 56(4), 443-465.

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 mic or external microphone
- **Other:** a mobile device (smartphone or tablet) to use for BuckeyePass authentication

If the student does not have access to the technologies, options for [technology and internet access](https://go.osu.edu/student-tech-access) (go.osu.edu/student-tech-access) should be considered.

Required Software

Microsoft Office 365: All Ohio State students are now eligible for free Microsoft Office 365. Visit the [installing Office 365](https://go.osu.edu/office365help) (go.osu.edu/office365help) help article for full instructions.

CarmenCanvas Access

Each student will need to use [BuckeyePass](https://buckeyepass.osu.edu) (buckeyepass.osu.edu) multi-factor authentication to access this course in Carmen. To ensure connection to Carmen, the following is recommended:

- Register multiple devices in case something happens to your primary device. Visit the [BuckeyePass - Adding a Device](https://go.osu.edu/add-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](https://go.osu.edu/install-duo) (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 these options do not work, contact the IT Service Desk at [614-688-4357 \(HELP\)](tel:614-688-4357) and IT support staff will provide a solution.

Technology Skills Needed for This Course

- Basic computer and web-browsing skills
- [Navigating CarmenCanvas](https://go.osu.edu/canvasstudent) (go.osu.edu/canvasstudent)
- [CarmenZoom virtual meetings](https://go.osu.edu/zoom-meetings) (go.osu.edu/zoom-meetings)
- [Recording a slide presentation with audio narration and recording, editing and uploading video](https://go.osu.edu/video-assignment-guide) (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 \(HELP\)](tel:614-688-4357)
- **Email:** servicedesk@osu.edu

Grading and Faculty Response

How Your Grade is Calculated

Assignment Category	Points
One report per week for 14 weeks (5 pts per report)	70
Seven quizzes; alternate weeks beginning in second week; two lowest quiz scores will be dropped.	15
Final examination	15
Total	100

See [Course Schedule](#) for due dates.

Descriptions of Major Course Assignments

Weekly Reports

Description: The significant assignments are short weekly reports submitted in Carmen on the Monday following a week of lectures and laboratories on the topic of the report. The topic for each assignment is identified in the Course Schedule. Since the objective of the weekly reports changes each week, a template for the weekly reports will be provided. The template will include a brief introduction, the objective of the assignment, brief description of background and information sources, an explanation and discussion of the topic, conclusions, and a list of research references. See the Course Schedule for additional details.

Academic integrity and collaboration: All written weekly reports must be the original work of the student.

Quizzes

Description: Short quizzes will be given in class. Quizzes are scheduled on an alternate week basis. These 15-20 min quizzes will focus on information presented and discussed during previous week. The specific topics are identified in the Course Schedule.

Academic integrity and collaboration: All answers to quiz questions must be the original work of the student.

Final Examination

Description: The final examination will take place in class during the assigned final examination time for this course. The exam will include questions based on information presented and discussed throughout the semester as identified in the Course Schedule.

Academic integrity and collaboration: All answers to examination questions must be the original work of the student.

Late Assignments

Due dates for written reports are on Monday of every week beginning with the second week of the semester. In case of emergencies and other circumstances that prevent you from turning in an assignment on time, please contact Dr. Dennis Heldman as soon as possible by email. Official documentation (e.g., from a doctor's office or hospital or interviewer) must be provided. A penalty of 10% per day for late submission of weekly reports will be assessed up to one week; after 1 week late, the student will receive 0% for the assignment, unless a documented excuse is provided by the student.

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-HELP** at any time if you have a technical problem.)

- **Preferred contact method:** First contact should be at Ohio State email address. Student will receive a response within **24 hours**.
- **Class announcements:** All important class-wide messages will be posted on the Announcements tool in CarmenCanvas.
- **Grading and feedback:** Grades for all assignments submitted before the due date will be posted within seven days. Additional feedback on assignment and grades will be arranged through an appointment. Assignments submitted after the due date may have reduced feedback and grades may take longer to be posted.

Grading Scale

93–100: A
 90–92.9: A-
 87–89.9: B+
 83–86.9: B
 80–82.9: B-
 77–79.9: C+

73–76.9: C
 70–72.9: C-
 67–69.9: D+
 60–66.9: D
 Below 60: E



Other Course Policies

Discussion and Communication Guidelines

- **Writing style:** Weekly reports should be written using good grammar, spelling, and punctuation.
- **Tone and civility:** Guidance for discussions on controversial topics will be provided during lecture sessions.
- **Cite sources:** References for information presented in weekly reports must be cited by using a complete reference or link.
- **Backing up documents:** Reports should be composed in a word processing program and saved before posting on the Carmen site.

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

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](#) (studentconduct.osu.edu), 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 a student is suspected of committing academic misconduct, the instructor must (by university rules) report the misconduct to the Committee on Academic Misconduct. If COAM confirms the violation, the university's Code of Student Conduct (i.e., committed



academic misconduct) results in sanctions for the misconduct could include a failing grade and suspension or dismissal from the university.

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

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

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.

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:

1. Online reporting form at equity.osu.edu,
2. Call 614-247-5838 or TTY 614-688-8605,
3. 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."

Diversity

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>
- <http://mcc.osu.edu/>

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

Your Mental Health

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. 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 Counseling and Consultation Services (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 National Suicide Prevention Hotline at 1-(800)-273-TALK or at suicidepreventionlifeline.org

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.

Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

The university strives to make all learning experiences as accessible as possible. If academic barriers based on your disability including mental health, chronic or temporary medical conditions are experienced, the course instructors should be contacted immediately so options can be discussed. To establish reasonable accommodations, students should register with [Student Life Disability Services \(SLDS\)](#). After registration, students should meet with instructors as soon as possible to discuss accommodations and implementation in a timely manner.

Disability Services Contact Information

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

Accessibility of Course Technology

Online portions of this course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If additional services are needed, students should request accommodations as early as possible.

- [CarmenCanvas accessibility](http://go.osu.edu/canvas-accessibility) (go.osu.edu/canvas-accessibility)
- Streaming audio and video
- [CarmenZoom accessibility](http://go.osu.edu/zoom-accessibility) (go.osu.edu/zoom-accessibility)

UNIVERSITY RESOURCES

Grievances:

According to University Policies, if you have a problem with this class, you should seek to resolve the grievance concerning a grade or academic practice by speaking first with the instructor or professor. Then, if necessary, take your case to the department chairperson, college dean or associate dean, and to the provost, in that order. Specific procedures are outlined in Faculty Rule 3335-7-23. Grievances against graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant's department.

Content Warning:

While I do not anticipate any upsetting content in this course, if needed, please take care of yourself while watching/reading the material (take a break, debriefing with a friend, contacting a Sexual Violence Support Coordinator at 614-292-1111 or Counseling and Consultation Services at 614-292-5766, and contacting the instructor if needed). Expectations are that we all will be respectful of our classmates while consuming media. Failure to show respect to each other may result in dismissal from the class.

Lyft Ride Smart at Ohio State:

[Lyft Ride Smart at Ohio State](#) offers eligible students discounted rides, inside the university-designated service area, from 7 p.m. to 7 a.m. Each month, 10,000 discounted rides will be made available on a first-come, first-served basis with the average cost expected to be \$2 or less. Prices may be impacted by distance, traffic, time of day, special events and prime time surcharges. To qualify for program discounts, users must select "shared ride" when booking in the Lyft app. When using ride sharing, remember to visually confirm vehicle info/descriptions in the company app and ask the driver to say who they are picking up.

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.

Course Schedule

Refer to the CarmenCanvas course for up-to-date due dates.

Week	Potential Points*	Topics, Readings, Assignments, Due Dates
One	5 pts report	<p>Introduction to the food supply chain; understanding the scope and complexity of the supply chain and the important role of unit operations in converting raw food materials into safe and high-quality consumer products in a sustainable manner.</p> <p><u>Background reading: NAS Report (2015)</u></p> <p><u>Assignment #1:</u> a report on the required operations for a specific food product selected from one of the five consumer food product categories.</p>
Two	5 pts report 3 pts quiz 8 total	<p>The role of preservation in a sustainable food supply chain. An introduction to the concepts of food preservation and understanding the shelf life of a food product in the context of preservation. The use of reduced or elevated temperature and/or reduced water content to extend the time that a food has acceptable high quality.</p> <p><u>Background reading:</u> Understanding the difference between food safety and extended shelf life of a high-quality food. Fellows (2016)</p> <p><u>Assignment #2:</u> a report on the differences between the safety and the quality attributes for the food product selected for Assignment #1. Quiz #1.</p>
Three	5 pts report	<p>An introduction to sustainability parameters; use of Life-Cycle Assessment (LCA) to quantify impacts of industrial operations on natural resource and the environment. Recognizing the LCA parameters used to quantify sustainability of the food supply chain; energy demand, water footprint, greenhouse gas emissions, carbon footprint, food waste and other environmental impacts.</p> <p><u>Background reading:</u> Cacurachi, et al (2019); Morawicki, R.O. (2012)</p> <p><u>Assignment #3:</u> a report on the LCA parameters used to quantify the sustainability of the food product selected for Assignment #1.</p>



Week	Potential Points*	Topics, Readings, Assignments, Due Dates
Four	5 pts report 3 pts quiz 8 total	<p>The role of sanitation in the food supply chain; the importance of sanitary design of food contact surfaces. The role of regulatory agencies in ensuring a safe food supply. The respective roles of FDA, USDA, state and local agencies in establishing and enforcing standards. The impact of regulations on sustainability parameters for the food supply.</p> <p>Background reading: Ridoutt and Pfister (2010)</p> <p><u>Assignment #4</u>: a report on the regulations and standards impacting the food product selected for Assignment #1.</p> <p><u>Quiz #2</u></p>
Five	5 pts report	<p>Handling and storage operations for raw food materials and ingredients; the use of water for washing of fruits and vegetables prior to fresh produce marketing. Lecture will cover pumps used for bulk transport of liquid products, storage and transport of grain prior to manufacturing, handling and storage of raw meat products, and impacts of these operations on sustainability parameters and on food waste.</p> <p>Background Reading: Tassou (2014)</p> <p><u>Assignment #5</u>: a report on the contribution of raw material handling and storage on LCA parameters for the food product selected for Assignment #1.</p>
Six	5 pts report 3 pts quiz 8 total	<p>The role of refrigeration in the food supply chain; maintaining food quality and extending the shelf-life of food products. Topics covered include the impacts of refrigeration on LCA parameters for a refrigerated food, illustrating the impact of the refrigerated food delivery systems from harvest or assembly of raw materials to the refrigerator in the home, the role of refrigeration in reducing food waste.</p> <p>Background reading: Heller and Koeleian (2003)</p> <p><u>Assignment #6</u>: a report on impacts of refrigeration on the LCA parameters for the food product selected for Assignment #1.</p> <p><u>Quiz #3</u>.</p>
Seven	5 pts report	<p>The role of heat exchangers in ensuring maximum thermal energy efficiency, including description of typical heat exchangers (conduction, convection, radiation, microwave) used throughout the food supply chain. Steps to achieve maximum efficiency in use of thermal energy, including the efficiency of thermal energy exchange during food preparation at food service and in the home.</p> <p>Background reading: Heller and Koeleian (2000); Uhlin (1997).</p> <p><u>Assignment #7</u>: a report on thermal energy exchange impacts on the LCA parameters for the food product selected for Assignment #1.</p>

Week	Potential Points*	Topics, Readings, Assignments, Due Dates
Eight	5 pts report 3 pts quiz 8 total	<p>The use of thermal energy for preservation and preparation of food; extending shelf-life of a product by elevating the temperature to inactivate spoilage microorganisms and pathogens. A discussion of blanching of solid foods, pasteurization of liquid foods, commercial sterilization of canned foods and final preparation of the food, and the impacts on LCA parameters. Food waste during preservation processes. Background reading: Mogensen, et al (2012) <u>Assignment #8</u>: a report on impact of preservation on the LCA parameters for the food product selected for Assignment #1. <u>Quiz #4</u>.</p>
Nine	5 pts report	<p>The frozen food supply chain; the operations required to remove thermal energy from food during the manufacturing of frozen foods, the energy requirements for transportation and low-temperature storage of a frozen food, including storage in the home. Sustainability parameters for frozen foods; impacts on food waste. Background reading: Canning, et al (2010) <u>Assignment #8</u>: a report on impact of food/ingredient freezing on the LCA parameters for the food product selected for Assignment #1.</p>
Ten	5 pts report 3 pts quiz 8 total	<p>The concentration and drying of food products and ingredients; the removal of water to reduce volume for storage and distribution of the product or ingredient. An introduction to unit operations for concentration and drying of food. Impacts of water removal on LCA parameters and food waste. Operations associated with the manufacturing of bakery products. Background reading: Bevilacqua, et al (2007). <u>Assignment #9</u>: a report on impact of concentration/drying on the LCA parameters for the food product selected for Assignment #1. <u>Quiz #5</u>.</p>
Eleven	5 pts report	<p>The manufacturing of liquid food ingredients; an introduction to the operations used for mechanical separation and the membrane technologies for refined separation for liquid food ingredients. Impacts on sustainability parameters and food waste. Applications to waste streams and reclamation of water from manufacturing operations. Background reading: McCarthy, et al (2015) <u>Assignment #10</u>: a report on impacts of liquid food ingredient operations on the LCA parameters for the food product selected for Assignment #1.</p>



Week	Potential Points*	Topics, Readings, Assignments, Due Dates
Twelve	5 pts report 3 pts quiz 8 total	The operations involving the extraction of food ingredients from solid raw materials; the grinding of grain for flour manufacturing; the extraction of oil from oil seeds. Impact of extraction operations on LCA parameters and food waste. Background reading: Lundie and Peters (2005) <u>Assignment #12</u> : a report on the contribution of dry ingredients to the LCA parameters for the food product selected for Assignment #1. <u>Quiz #6.</u>
Thirteen	5 pts report	The packaging and containers used for food products and ingredients throughout the food supply chain; packaging/container materials for liquid and solid foods. The role of packaging for different food products. The LCA parameters for packaging materials, and the contributions of packaging to the LCA for the food product. The influence of packaging on food waste. <u>Background reading</u> : Leib and Gunders (2013) <u>Assignment #13</u> : a report on the impact of packing on LCA parameters for the food product selected in Assignment #1.
Fourteen	5 pts report 3 pts quiz 8 total	Cleaning and sanitation throughout the food supply chain; an introduction to the materials and operations required to ensure a safe food supply. Evaluating the contribution of cleaning and sanitation to LCA parameters, with attention to washing of raw food materials and the sanitation of food contact surfaces. Cleaning operations and waste streams. Background reading: Gleick and Palaniappan (2010); Ridoutt and Huang (2012) <u>Assignment #14</u> : a report on the contribution of cleaning and sanitation to the LCA parameters for the food product selected for Assignment #1. <u>Quiz #7.</u>
	15 pts	Final Examination. The final exam will take place during the scheduled final exam time for this course.

*Two lowest quiz scores will be dropped.

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 seeking 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.

Course subject & number FDSCTE/FABE 3400

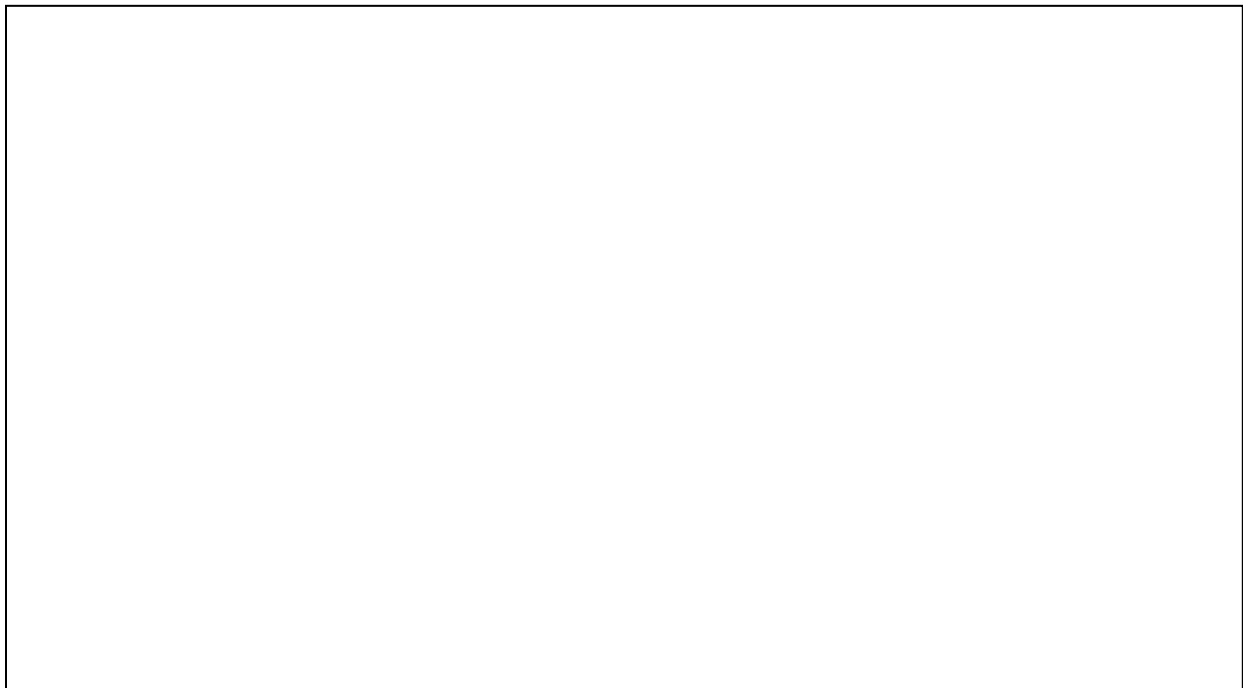
General Expectations of All Themes

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)*

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)

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)

A large, empty rectangular box with a thin black border, intended for the user to provide the specific activities and assignments linked to the ELOs.

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)

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)

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)

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)

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)

Interdisciplinary Team-Taught Course Inventory

Overview

The GE allows students to take a single, 4+ credit course to satisfy a particular GE Theme requirement if that course includes key practices that are recognized as integrative and high impact. Courses seeking one of these designations need to provide a completed Integrative Practices Inventory at the time of course submission. This will be evaluated with the rest of the course materials (syllabus, Theme Course submission document, etc). Approved Integrative Practices courses will need to participate in assessment both for their Theme category and for their integrative practice.

Please enter text in the boxes below to describe how your class will meet the expectations of Interdisciplinary Team-Taught courses. It may be helpful to consult the Description & Expectations document for this pedagogical practice or to consult your Director of Undergraduate Studies or appropriate support staff person as you complete this Inventory and submit your course.

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.

Accessibility

If you have a disability and have trouble accessing this document or need to receive it in another format, please reach out to Meg Daly at daly.66@osu.edu or call 614-247-8412.

Pedagogical Practices for Interdisciplinary Team-Taught Courses

Course subject & number

Performance expectations set at appropriately high levels (e.g. Students investigate large, complex problems from multiple disciplinary perspectives). Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

Interdisciplinary Team-Taught Course Inventory

Significant investment of time and effort by students over an extended period of time (e.g., engage the issue iteratively, analyzing with various lenses and seeking to construct an integrative synthesis). Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

Interactions with faculty and peers about substantive matters including regular, meaningful faculty mentoring and peer support about conducting interdisciplinary inquiry. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

Interdisciplinary Team-Taught Course Inventory

Students will get frequent, timely, and constructive feedback on their work, scaffolding multiple disciplinary perspectives and integrative synthesis to build over time. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

Periodic, structured opportunities to reflect and integrate learning (e. g. students should work to integrate their insights and construct a more comprehensive perspective on the issue). Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

Interdisciplinary Team-Taught Course Inventory

Opportunities to discover relevance of learning through real-world applications and the integration of course content to contemporary global issues and contexts. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

Public Demonstration of competence, such as a significant public communication of their integrative analysis of the issue. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

Interdisciplinary Team-Taught Course Inventory

Experiences with diversity wherein students demonstrate intercultural competence and empathy with people and worldview frameworks that may differ from their own. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

Explicit and intentional efforts to promote inclusivity and a sense of belonging and safety for students, e.g. universal design principles, culturally responsive pedagogy, structured development of cultural self-awareness. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

Interdisciplinary Team-Taught Course Inventory

Clear plans to promote this course to a diverse student body and increase enrollment of typically underserved populations of students. Please link this expectation to the course goals, topics and activities and indicate *specific* activities/assignments through which it will be met. (50-500 words)

From: [Prud'homme, Andrea](#)
To: [Osborne, Jeanne](#); [Hill, James](#)
Cc: [Davis, Molly J.](#); [Rodriguez-Saona, Luis](#); [Heldman, Dennis R.](#)
Subject: RE: Concurrence Requested for Course Change - FDSCTE 3400, Sustainability of the Food Supply Chain
Date: Wednesday, January 12, 2022 10:00:00 AM
Attachments: [image001.png](#)

Jeanne:

No, we don't have any issues with this. The class is clearly different from anything we have in Fisher and aimed for a different audience.

Andrea

Andrea M. Prud'homme, PhD, CPIM-F, CSCP, CLTD, CIRM

Pronouns: she/her/hers Honorific: Dr.

Associate Dean Undergraduate Programs & Students

Associate Professor – Clinical, Dept of Operations and Business Analytics

Fisher College of Business

200D Fisher Hall

614.292.3173 Office

prudhomme.3@osu.edu

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From: Osborne, Jeanne <osborne.2@osu.edu>
Sent: Tuesday, January 11, 2022 3:23 PM
To: Prud'homme, Andrea <prudhomme.3@osu.edu>
Cc: Davis, Molly J. <davis.2020@osu.edu>; Rodriguez-Saona, Luis <rodriguez-saona.1@osu.edu>; Heldman, Dennis R. <heldman.20@osu.edu>
Subject: RE: Concurrence Requested for Course Change - FDSCTE 3400, Sustainability of the Food Supply Chain

Dear Dr. Prud'homme,

I wanted to circle back with you on this request since the proposed response timeframe for feedback is this week. Do you anticipate any issues with the concurrence process for the course? With the holidays and the challenges for your faculty with the COVID situation, I know that the last month has flown by.

Let me know and thank you!

Jeanne

From: Osborne, Jeanne
Sent: Monday, December 20, 2021 10:33 AM
To: Prud'homme, Andrea <prudhomme.3@osu.edu>

Cc: Davis, Molly J. <davis.2020@osu.edu>; Rodriguez-Saona, Luis <rodriguez-saona.1@osu.edu>; Heldman, Dennis R. <heldman.20@osu.edu>

Subject: Concurrence Requested for Course Change - FDSCTE 3400, Sustainability of the Food Supply Chain

Dear Dr. Prud'homme,

The College of Food, Agricultural, and Environmental Sciences, Department of Food Science and Technology is requesting Fisher College of Business concurrence for a Course Change Request. The current course, FDSCTE 3400, 'Food Supply-Chain Equipment Operations' is proposed to be revised to fulfill a Sustainability Theme GE course in the new GE, including a title change to reflect the added focus in sustainability – FDSCTE 3400, 'Sustainability of the Food Supply Chain'. The focus of the course is proposed to include more of the environmental impact aspect of food production and the food-supply chain - taking raw materials and transforming to consumer products, while being conscious of environmental sustainability and minimizing environmental impact. The focus on equipment operations (as reflected in the current title) is being reduced in the course.

The focus of this course on the food-supply chain, while not new to the course, is highly relevant in the context of sustainability. A new text was recently published in this area and is included as a required resource in the course, 'Food Engineering Innovations Across the Food Supply Chain' (Ch. 3, 'Sustainability of the food supply chain: energy, water and waste')

We anticipate that courses in the Fisher College of Business such as BUSML 4385, 'Building a Sustainable Supply Chain'; BUSOBA 4253, 'Sustainable Operations'; and BUSOBA 4254, 'Projects in Sustainable Supply Chains', that are focused on sustainable operations and supply-chain dynamics may include food as one of the components of the course, but in a more generalized and business-focused context compared to the revised course in Food Science and Technology.

With the holiday in mind, we would appreciate consideration of this request and a response from the Fisher College of Business by Thursday, January 13, 2022. Please let me know if you have any concerns about this timeframe, and if you have any questions or need additional information.

Thank you, and best wishes for a restful holiday season!

Jeanne



Jeanne M. Osborne | *Pronouns: She, Her, Hers*

Assistant Dean for Academic Affairs

College of Food, Agricultural, and Environmental Sciences

100E Agricultural Administration, 2120 Fyffe Rd.

Columbus, OH 43210

Tel: 614-292-1734

Fax: 614-292-1218

e-mail: Osborne.2@osu.edu

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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 respond 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: CFAES Food Science & Technology

Date: 10/21/2021

Registrar's Listing: FDSCTE 3400

Course Number: 3400

Level: U P G

Credit Hours: 4

Course Title: Sustainability of the Food Supply Chain

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): School of Environment and

Natural Resources

Date responses are needed: 11/4/2021

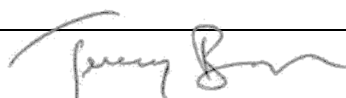
B. Information from academic units *reviewing* the request:

- 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)

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 respond 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: CFAES Food Science & Technology

Date: 10/21/2021

Registrar's Listing: FDSCTE 3400

Course Number: 3400

Level: U P G

Credit Hours: 4

Course Title: Sustainability of the Food Supply Chain

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): Evolution, Ecology and Organismal Biology

Date responses are needed: 11/4/2021

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: [Osborne, Jeanne](#)
To: [Davis, Molly J.](#)
Subject: FW: Concurrence Request for FDSCTE 3400
Date: Friday, October 22, 2021 12:15:59 PM
Attachments: [image001.png](#)
[image002.png](#)

Molly,

For your records and to attach to the course proposal.

Take care,

Jeanne

From: Kwiek, Jesse <kwiek.2@osu.edu>
Sent: Friday, October 22, 2021 12:14 PM
To: Osborne, Jeanne <osborne.2@osu.edu>
Cc: Fredrick, Kurt <fredrick.5@osu.edu>
Subject: Re: Concurrence Request for FDSCTE 3400

Dear Jeanne,
The Microbiology Department supports approval of this course.
Jesse

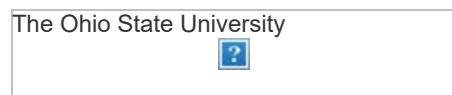
Jesse J. Kwiek, Ph.D. (he/him/his)
Associate Professor
Vice Chair for Teaching & Undergraduate Affairs
Department of Microbiology
Ohio State University
Lab: 412 Biological Sciences Building
Office: 476 Biological Sciences Building
484 West 12th Avenue
Columbus, OH 43210
kwiek.2@osu.edu
Phone: 614-292-3256

From: Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>
Date: Thursday, October 21, 2021 at 3:09 PM
To: _ASC NMS Chairs Directors <ASC-nms-chairs-directors@osu.edu>, _ASC NMS UG Directors <ASC-NMS-UG-Directors@osu.edu>
Cc: Osborne, Jeanne <osborne.2@osu.edu>, Martin, Andrew <martin.1026@osu.edu>
Subject: FW: Concurrence Request for FDSCTE 3400

Dear all,

Please find attached a proposal for a revised and expanded version of existing course FDSCTE/FABENG 3400 "Sustainability of the Food Supply Chain" in CFAES. It will be a 4-credit course applying for the Sustainability Theme status in the new GE. The Department of Food Science and Technology is seeking concurrence for the new course. Please email your responses/concurrences to Jeanne Osborne (osborne.2@osu.edu), Assistant Dean in CFAES, and cc me. *Responses are due by **Friday, November 5, 2021***. Concurrence will be assumed if no response is received within two weeks.

Many thanks,
Bernadette



Bernadette Vankeerbergen, Ph.D.
Assistant Dean, Curriculum
College of Arts and Sciences
306B Dulles Hall, 230 Annie & John Glenn Ave.
Columbus, OH 43210
Phone: 614-688-5679
<http://ascas.osu.edu>

From: Osborne, Jeanne <osborne.2@osu.edu>
Sent: Thursday, October 21, 2021 1:43 PM
To: Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>
Cc: Davis, Molly J. <davis.2020@osu.edu>; Rodriguez-Saona, Luis <rodriguez-saona.1@osu.edu>
Subject: Concurrence Request for FDSCTE 3400

Dear Bernadette,

Attach please find a concurrence request from the Department of Food Science and Technology in CFAES for a course that is being changed, FDSCTE/FABENG 3400 – Sustainability of the Food Supply Chain. In addition to concurrence from academic units in the CFAES, we believe there is value in review by your college since the scope of the course has been expanded. Would you please forward the attached concurrence form and syllabus to the appropriate unit(s) within your college? We would appreciate feedback by Friday, November 5, 2021.

Please let me know if you have any questions or need additional information.

Take care, and have a great rest of your week!

Jeanne



Jeanne M. Osborne | *Pronouns: She, Her, Hers*

Assistant Dean for Academic Affairs

College of Food, Agricultural, and Environmental Sciences

100E Agricultural Administration, 2120 Fyffe Rd.

Columbus, OH 43210

Tel: 614-292-1734

Fax: 614-292-1218

e-mail: Osborne.2@osu.edu

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From: [Osborne, Jeanne](#)
To: [Davis, Molly J.](#)
Subject: FW: Concurrence Request for FDSCTE 3400
Date: Monday, November 8, 2021 11:44:49 AM
Attachments: [image001.png](#)
[FDSCTE3400SustainabilitySyllFinal21_10-21.docx](#)
[ASC Ohio State Course Review Concurrence Form - FDSCTE 3400.pdf](#)
[image002.png](#)

From: Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>
Sent: Thursday, October 21, 2021 3:09 PM
To: _ASC NMS Chairs Directors <ASC-nms-chairs-directors@osu.edu>; _ASC NMS UG Directors <ASC-NMS-UG-Directors@osu.edu>
Cc: Osborne, Jeanne <osborne.2@osu.edu>; Martin, Andrew <martin.1026@osu.edu>
Subject: FW: Concurrence Request for FDSCTE 3400

Dear all,

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Many thanks,
Bernadette

The Ohio State University



Bernadette Vankeerbergen, Ph.D.

Assistant Dean, Curriculum

College of Arts and Sciences

306B Dulles Hall, 230 Annie & John Glenn Ave.

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Phone: 614-688-5679

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Sent: Thursday, October 21, 2021 1:43 PM
To: Vankeerbergen, Bernadette <vankeerbergen.1@osu.edu>

Cc: Davis, Molly J. <davis.2020@osu.edu>; Rodriguez-Saona, Luis <rodriguez-saona.1@osu.edu>
Subject: Concurrence Request for FDSCTE 3400

Dear Bernadette,

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Please let me know if you have any questions or need additional information.

Take care, and have a great rest of your week!

Jeanne



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