Term Information

Effective Term	Spring 2023

General Information

Course Bulletin Listing/Subject Area	Food, Agricul & Bio Engineer
Fiscal Unit/Academic Org	Food, Agric & Biological Eng - D1123
College/Academic Group	Engineering
Level/Career	Undergraduate
Course Number/Catalog	3210
Course Title	Introduction to Humanitarian Engineering
Transcript Abbreviation	Intro Humanit Eng
Course Description	This course will introduce students to the field of Humanitarian Engineering, cover a variety of potential career paths in this field, explore engineering equations as they apply to problem solving in low-resource settings, introduce students to reflection and communication skills for working as engineers in sustainable development and discuss cultural constraints for engineering problems.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
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	
Exclusions	
Electronically Enforced	No

Cross-Listings

Cross-Listings	

Subject/CIP Code

Subject/CIP Code	14.0301
Subsidy Level	Baccalaureate Course
Intended Rank	Junior

Requirement/Elective Designation

Sustainability

Course Details

Course goals or learning objectives/outcomes

- Identify multiple potential career paths within humanitarian engineering
- Describe a participatory approach to humanitarian engineering
- Apply engineering equations to low-resource design solutions
- Utilize self-reflection techniques for processing new experiences
- Describe a participatory approach to humanitarian engineering
- Analyze trends and impacts of cultural systems, natural resource availability and technology access globally on engineering design processes (particularly problem definition and identification of constraints)
- Critically review contemporary research and project literature in sustainable development engineering

Content Topic List

- Current research in Humanitarian Engineering and how to approach the literature
- Global trends in human/environment interaction
- Lifestyle variations and relevance to engineering design
- Global trends in natural resource distribution, technology availability, colonization and independence timelines
- Introduction to participatory community development for technology adoption
- Individual reflection and processing techniques for designing in the field
- Sanitation opportunities and tried solutions
- Challenges and design for engineering in participatory community development

Sought Concurrence

No

Attachments

- FABE 3210plus3211_interdisciplinary-team-taught-inventory_3_25_22.pdf

  (Other Supporting Documentation. Owner: Conroy,Kristen)
- FABE 3210 GE Sustainablity submission form_12_1_21.pdf

  (Other Supporting Documentation. Owner: Conroy,Kristen)
- FABE 3210_3211 cover letter intergrative interdisciplinary_7_13_22.docx

  (Cover Letter. Owner: Conroy,Kristen)
- FABE 3210_3211_Sustainability GE Themes_Cover Letter_7_16_22.docx

  (Cover Letter. Owner: Conroy,Kristen)
- FABE 3210 Syllabus SP23_GE_Sustainability_9_27_22.pdf

  (Syllabus. Owner: Conroy,Kristen)
- FABE 3210_3211 cover letter intergrative interdisciplinary follow up_9_27_22.docx: Cover Letter 9/27/22

  (Cover Letter. Owner: Conroy,Kristen)
- FABE 3210_3211 teaching schedule and interdisciplinary learning outcomes.docx

  (Other Supporting Documentation. Owner: Conroy,Kristen)

Comments

- Please see Panel feedback e-mail sent 08/30/22. *(by Cody,Emily Kathryn on 08/30/2022 04:53 PM)*
- Adjust as per email feedback 15 July 2022

Revise as per COAA via email message 7 March 2022 *(by Osborne,Jeanne Marie on 07/15/2022 10:27 AM)*

- Please see Panel feedback email sent 05/17/2022. *(by Hilty,Michael on 05/17/2022 04:40 PM)*
- Per Jeanne's email, the Sustainability Theme GE form is not attached. *(by Chen,Qian on 03/25/2022 02:36 PM)*

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Conroy,Kristen	12/20/2021 04:23 PM	Submitted for Approval
Approved	Chen,Qian	12/21/2021 08:19 PM	Unit Approval
Revision Requested	Quinzon-Bonello,Rosario	01/04/2022 10:37 AM	Ad-Hoc Approval
Submitted	Conroy,Kristen	01/04/2022 11:35 AM	Submitted for Approval
Approved	Chen,Qian	01/04/2022 11:28 PM	Unit Approval
Revision Requested	Quinzon-Bonello,Rosario	01/21/2022 08:23 AM	Ad-Hoc Approval
Submitted	Conroy,Kristen	02/08/2022 10:20 AM	Submitted for Approval
Approved	Chen,Qian	02/09/2022 10:10 AM	Unit Approval
Approved	Quinzon-Bonello,Rosario	02/23/2022 04:56 PM	Ad-Hoc Approval
Revision Requested	Osborne,Jeanne Marie	03/07/2022 02:13 PM	College Approval
Submitted	Conroy,Kristen	03/25/2022 08:16 AM	Submitted for Approval
Revision Requested	Chen,Qian	03/25/2022 02:36 PM	Unit Approval
Submitted	Conroy,Kristen	03/28/2022 08:25 AM	Submitted for Approval
Approved	Chen,Qian	04/01/2022 10:37 AM	Unit Approval
Approved	Quinzon-Bonello,Rosario	04/01/2022 10:38 AM	Ad-Hoc Approval
Approved	Osborne,Jeanne Marie	04/01/2022 01:10 PM	College Approval
Revision Requested	Hilty,Michael	05/17/2022 04:40 PM	ASCCAO Approval
Submitted	Conroy,Kristen	07/14/2022 11:56 AM	Submitted for Approval
Approved	Chen,Qian	07/14/2022 12:12 PM	Unit Approval
Approved	Quinzon-Bonello,Rosario	07/15/2022 09:25 AM	Ad-Hoc Approval
Revision Requested	Osborne,Jeanne Marie	07/15/2022 10:27 AM	College Approval
Submitted	Conroy,Kristen	07/18/2022 10:49 AM	Submitted for Approval
Approved	Chen,Qian	07/19/2022 02:22 AM	Unit Approval
Approved	Quinzon-Bonello,Rosario	07/19/2022 09:30 AM	Ad-Hoc Approval
Approved	Osborne,Jeanne Marie	07/20/2022 07:27 AM	College Approval
Revision Requested	Cody,Emily Kathryn	08/30/2022 04:53 PM	ASCCAO Approval
Submitted	Conroy,Kristen	09/27/2022 03:37 PM	Submitted for Approval
Revision Requested	Chen,Qian	09/27/2022 04:58 PM	Unit Approval
Submitted	Conroy,Kristen	09/27/2022 05:05 PM	Submitted for Approval
Approved	Chen,Qian	09/27/2022 06:46 PM	Unit Approval
Approved	Quinzon-Bonello,Rosario	09/28/2022 09:30 AM	Ad-Hoc Approval
Approved	Osborne,Jeanne Marie	09/30/2022 11:41 AM	College Approval
Pending Approval	Cody,Emily Kathryn Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	09/30/2022 11:41 AM	ASCCAO Approval

To whom it may concern,

This is a letter providing further detail on the FABE 3210/3211 Introduction to Humanitarian Engineering course that has been approved for the General Education Sustainability Theme and is currently being finalized for the High Impact Practice course approval. This letter is to clarify feedback provided from the committee based on their meeting on August 11th, 2022.

To address the panels feedback regarding how the instructors co-teaching will engage in Interdisciplinary Team-Teaching, we offer some background on the course development. These courses, FABE 3210/3211, were formed in response to several meetings in 2017 of people involved in teaching Humanitarian Engineering-focused courses. The group had representation from several departments, including the Civil, Environmental and Geodetic Engineering and the Food, Agricultural and Biological Engineering Departments. This group of faculty, staff and students determined a list of learning objectives which served as the basis for FABE 2200/2201, the class which has been adapted over time to FABE 3210/3211. Therefore, the course was developed through a cross-departmental collaborative process and has interdisciplinary learning objectives at its core.

To address the above concern and the panels request for further information regarding where team-teaching will occur, we have included a teaching schedule and related interdisciplinary learning outcomes in a separate attachment. The plan is to co-teach both FABE 3210/3211 together. Seven weeks of the semester will be co-lead by the instructors to allow for integration of content presented in previous and current sessions. Seven weeks will be led by individual instructors to discuss their disciplinary expertise. This information has been added to the "Mode of Delivery" section of the syllabi. Instructors will share grading duties and evaluation will be based on collaboratively defined criteria. This information has been added to the "Grading" section of the syllabi. The instructors will meet weekly outside of class to discuss the course and review plans for integration lectures.

We are hopeful this documents and addresses the committee's feedback.

Thank you,

Kristen Conroy and Patrick Sours

Introduction to Humanitarian Engineering Syllabus

FABE 3210 Spring 2023

Course Information

- **Course times and location:** Tuesday and Thursdays, 9:35 a.m.-10:55 a.m.; location:TBD
- **Credit hours:** 3
- **Mode of delivery:** In-Person

Instructor

Department of Food, Agricultural and Biological Engineering:

Name: Kristen Conroy
Email: conroy.137@osu.edu
Phone: 614-292-6131
Office location: Room 250 Agricultural Engineering Building, 590 Woody Hayes Drive
Office hours: by email (conroy.137@osu.edu)
Preferred means of communication:

My preferred method of communication for questions is **email.**
My 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.

Department of Civil, Environmental and Geodetic Engineering:

Name: Patrick Sours
Email: sours.17@osu.edu
Phone: 614-292-6131
Office location: Room 250 Agricultural Engineering Building, 590 Woody Hayes Drive
Office hours: Appointment by email (sours.17@osu.edu)
Preferred means of communication:
My preferred method of communication for questions is **email.**
My 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

There are no prerequisites for this course.

Course Description

This course will introduce students to the field of Humanitarian Engineering, cover a variety of potential career paths in this field, explore engineering equations as they apply to problem solving in low-resource settings, introduce students to reflection and communication skills for working as engineers in sustainable development and discuss cultural constraints for engineering problems.

Learning Outcomes

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

- Identify multiple potential career paths within humanitarian engineering
- Describe a participatory approach to humanitarian engineering
- Apply engineering equations to low-resource design solutions
- Utilize self-reflection techniques for processing new experiences
- Describe a participatory approach to humanitarian engineering
- Analyze trends and impacts of cultural systems, natural resource availability and technology access globally on engineering design processes (particularly problem definition and identification of constraints)
- Critically review contemporary research and project literature in sustainable development engineering

General Education Expected Learning Outcomes

This course fulfills the Specific Goals 1, 2 and 3 and Expected Learning Outcomes 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2 and 3.3 for the General Education Themes, Sustainability.

When this 3-credit FABE 3210 lecture is taken in combination with the 1-credit FABE 3211 laboratory, together these 4-credits (i.e., 3-credit lecture + 1-credit laboratory) fulfill ALL Goals (i.e., Goals 1, 2 and 3) and ALL Expected Learning Outcomes (i.e., ELOs 1.1, 1.2, 1.3, 2.1, 2.2, 3.1, 3.2 and 3.3) for the Themes, Sustainability GE category.

Important note: This course will fulfill 3 credit-hours towards the General Education Sustainability Theme when taken as a stand-alone course. If taken in conjunction with FABE 3211 (1 credit hour), this course will fulfill the General Education Sustainability Theme as a 4-credit hour Integrative Interdisciplinary Team-taught General Education course.

FABE 3210 FULFILLS

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

Expected Learning Outcome 1.1: Engage in critical and logical thinking about the topic or idea of sustainability.

Expected Learning Outcome 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.

Expected Learning Outcome 2.1: Identify, describe and synthesize approaches or experiences as they apply to sustainability.

Expected Learning Outcome 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.

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

Expected Learning Outcome 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.

Expected Learning Outcome 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 these learning outcomes through several activities:

Students complete an activity where they take an item used in daily life and must identify one element/natural resource used in the technology. Students must then identify where this resource is located and where it is consumed. Students research how the resource is extracted/mined/harvested and do calculations related to the energy and power needed for these processes. This allows students to draw connections between areas where extraction occurs and areas where consumption occurs and to understand the various methods of extraction and their requirements of human and/or fossil fuel energies. (Resources: Natural and Technical)

Students complete two activities where they review various photographic and video footage of people's day to day lives in a variety of locations around the globe. Students are asked to identify variations in human/environment interaction in these sources. Students reflect on the impacts of technology on lifestyle and human/environment interaction. (Day in the Life and Gapminder)

Students learn about colonization through activities identifying the year of independence for various countries and from which country they gained independence (Independence Timelines). Students listen and respond to lecture content and podcasts relaying the history of colonization in different parts of the world, including South America, Southeast Asia and the African continent and ongoing impacts. (Imperialism, Colonization and Decolonization)

Students write several reflection responses after 1) reviewing articles related to health impacts and failed attempts at altering cooking technologies, 2) innovations within refugee communities and 3) tracking their water use for several days and learning about ancient water collecting techniques. (Reflection Assignments 1-3)

Students write a statement about their perception of the value of acknowledging one's own perspective on a research topic, describe their own perspectives of engineering and explore their own knowledge of place after reading: Hess, Justin and Strobel, Johannes. 2013. Indigenous Ways of Doing: Synthesizing Scholarly Literature on Ethno-Engineering. International Journal of Engineering, Social Justice and Peace, 2 (2): 55-80. (Ethno-Engineering)

Students will prepare a technical paper and presentation focusing on one aspect of Humanitarian Engineering by exploring 5+ resources on the topic. Topics can range widely and may include natural resource distribution, technology transfer and capacity building or cutting-edge sustainable technologies.(Final Paper and Presentation)

Several times throughout the semester, students read a peer-reviewed journal article pertaining to humanitarian engineering and, with a partner, give a 10 minute review presentation of the article. Articles cover topics of technology design, impacts of technology on communities, frameworks for engaging communities in co-design. Topics covered include disaster relief shelters, improved garbage collectors, solar power, menstrual sanitation, wastewater treatment, drinking water treatment, communication devices, food preservation techniques and more. (Review of Research Articles)

How This Course Works

Mode of delivery: There are required classes Tuesday and Thursdays, 9:35 a.m.-10:55 a.m. The rest of your work is found in Carmen and can be completed around your own schedule during the week. Seven weeks of the semester will be co-led by the instructors to allow for integration of content presented in previous and current sessions. Seven weeks will be led by individual instructors to discuss their disciplinary expertise.

Credit hours and work expectations: This is a 3 credit-hour course. According to Ohio State bylaws on instruction (go.osu.edu/credithours), 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 (reading and assignment preparation, for example) to receive a grade of C average.

Attendance and participation requirements: Research shows regular participation is one of the highest predictors of success. With that in mind, I have the following expectations for everyone's participation:

- **Lectures**: **required**
  Attendance for all live, scheduled classes for the course is expected. Students will be expected to contribute to the learning process by sharing ideas and insights relative to the issues being discussed. Participation will also include preparing questions for guest lecturers and in-class activities. If you have a situation that might cause you to miss a class, discuss it with me *as soon as possible.* In the case of excused absences, students will have the opportunity to earn credit for missed in-class activities.

Course Materials, Fees and Technologies

Required Texts

- All required reading materials will be made available via the CarmenCanvas site. A list of readings can be found in the bibliography section at the end of this document.

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 you do not have access to the technology you need to succeed in this class, review options for technology and internet access (go.osu.edu/student-tech-access).

Required Software

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

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
- 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 (%)
Individual (Homework) Assignments	40
Team (Review of Research Article) Assignments	20
Class Participation	15
Final Paper and Presentation	25
Total	100

See Course Schedule for due dates.

Descriptions of Major Course Assignments

Individual Homework Assignments:
Individual homework assignments will be composed of reflection activities and summaries associated with various readings, videos, research, etc. Students should dedicate ample time to reflections and summaries that include responses to the material presented. Further detail on individual assignments will be provided on the Carmen site for this course. These assignments will account for 40% of the final grade.

Reviews of Research Articles:
Several times throughout the semester, students will read assigned peer-reviewed research articles on topics related to Humanitarian Engineering and sustainable development. Students will then work with a partner(s) to present a review of the article. This will include a summary of the rationale, methods, results, and conclusions, as well as a critical review of the relevance and quality of the research. One assignment per team per paper reviewed. These assignments will account for 20% of the final grade. For a list of articles, please refer to the Bibliography at the end of this document.

Class Participation:
Students will be expected to contribute to the learning process by sharing ideas and insights relative to the issues being discussed. Participation will also include preparing questions for guest lecturers and in-class activities. In the case of excused absences, students will have the opportunity to earn credit for missed in-class activities. Class participation and attendance will

account for 15% of the final grade.

Final Paper and Presentation:
Students will prepare a technical paper and presentation focusing on one aspect of Humanitarian Engineering by exploring 5+ resources on the topic. Topics can range widely and may include natural resource distribution, technology transfer and capacity building or cutting-edge sustainable technologies. Rubric for the Final paper and presentation can be found on the Carmen site for this course. Final paper and presentation will account for 25% of the final grade.

Late Assignments

Late assignments will not be accepted after the due date except in the case of an approved extension that has been arranged with the instructor prior to the due date (for example, as a result of an excused absence); or in the case of illness/emergency, contact the instructor as soon as possible. Extensions will be determined on a case-by-case basis with official documentation.

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 (conroy.137@osu.edu). Please do not email conroy.137@buckeyemail.osu.edu. I will do my best to reply to emails within **24 hours on days when class is in session at the university**.
- **Class announcements:** We 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.
- **Grading and feedback:** For assignments submitted by the due date, I will try to provide feedback and grades within **seven days**. Instructors will share grading duties and base scoring on defined criteria.

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

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

- **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.
- **Citing your sources**: When we have academic discussions, please cite your sources to back up what you say. For course materials, list at least the first author, title and page numbers. For online sources, include the first author, title and 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 online 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 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)

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."

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

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

Accessibility Accommodations for Students with Disabilities

Requesting Accommodations

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

Accessibility of Course Technology

This online 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)

Course Schedule

Refer to the CarmenCanvas course for up-to-date due dates. (A) indicates assignments.

Week	Topics and Assignments
1	How do engineering and sustainability fit in to humanitarian work?
2	Current research in Humanitarian Engineering and how to approach the literature • Positionality Statements (A)
3	Global trends in human/environment interaction • IDI assessment (A)
4	Lifestyle variations and relevance to engineering design • Gapminder (A) • Day in the life (A)
5	Global trends in natural resource distribution, technology availability, colonization and independence timelines • Resources: Natural and Technical (A)
6	Introduction to participatory community development for technology
7	Case study: stormwater management • Reflection Assignment #1 (A) • Guest Lecture Reflection (A)
8	Individual reflection and processing techniques for designing in the field • Knowledge/Attitude/Practice Assignment (A)
9	Career paths/guest speaker • Guest Lecture Prep (A) • Reflection Assignment #2 (A)
10	Case study: agricultural and food systems • Guest Lecture Reflection (A)
11	Social impact companies • Social-Impact Company Assignment (A)
12	Case study: wastewater and sanitation solutions

13	Challenges and design for engineering in participatory community development
14	Other professionals involved in Humanitarian Engineering/Development • Reflection Assignment #3 (A)
15	• Final Presentation and Report (A)

Bibliography

Required Readings:

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Blue Diversion Toilet. Sciences of the Total Environment 576: 264-272. https://doi.org/10.1016/j.scitotenv.2016.10.057

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Research Review Articles:

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Peerapong, P. and Limmeechokchai, B. 2017. Optimal electricity development by increasing solar resources in diesel-based micro grid of island society in Thailand, Energy Reports 3: 1-13. https://doi.org/10.1016/j.egyr.2016.11.001

Pichel, N., Viva, M., Feuntes, M. and Eugenio-Cruz, K. 2020. Study of hybrid photovoltaic-photochemical technology for meeting the needs of safe drinking water and electricity in developing countries: First field trial in rural Mexico. Journal of Water Process Engineering 33: 1-8. https://doi.org/10.1016/j.wpe.2019.101056

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Udomkun, P., Romuli, S., Schock, S., Mahayothee, B., Sartas, M., Wossen, T., Njukwe, E., Vanlauwe, B., Müller, J. 2020. Review of solar dryers for agricultural products in Asia and Africa: An innovation landscape approach. Journal of Environmental Management 268: 110730. https://doi.org/10.1016/j.jenvman.2020.110730

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Zaylaa, A. J., Rashid, M., Shaib, M., and El Majzoub, I. 2018. A Handy Preterm Infant Incubator for Providing Intensive Care: Simulation, 3D Printed Prototype, and Evaluation. Journal of healthcare engineering: 893798. https://doi.org/10.1155/2018/8937985

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.

FABE 3210

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)*

This course deeply engages the General Education Theme's definition of Sustainability. Students explore various lifestyles and access to resources and technology globally. These variations are tied to concepts of colonization and imperialism through lecture and assignment content. Student's explore their own reliance on environmental systems by tracking water usage and discussing the various ways in which water is obtained globally. Student's explore further reliance on Earth through exploring the intersections of global trade and economics on the extraction, sale and use of basic elements in technologies. Students explore the value, and historic undervaluing, of local/indigenous knowledge. Students explore the peer-reviewed literature to learn about a topic related to Sustainability and Humanitarian Engineering that is of strong interest to them in the final project. Students are also asked to critically review research articles in the subject area and present these review to their classmates several times per semester. These are recent articles in the field of Humanitarian Engineering and assist students in engaging with the research and cutting-edge findings in this topic area.

Course subject & number FABE 3210

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)

Relevant course Learning Outcome:
- Describe a participatory approach to humanitarian engineering

Students engage in critical and logical thinking about Sustainability through several activities and assignments including:

Reading and answering questions related to Chapter 8, Food and Agriculture, from Open Geography.

Reading about the Venezuelan economic collapse and discussing in class.

Watching the documentary "Living on One Dollar" and answer questions on central aspects of the film.

Read/watch various articles and clips related to alternative, sustainable sanitation solutions and answer questions related to these technologies.

Students complete two activities where they review various photographic and video footage of people's day to day lives in a variety of locations around the globe. Students are asked to identify variations in human/environment interaction in these sources. Students reflect on the impacts of technology on lifestyle and human/environment interaction.

Students complete an activity where they take an item used in daily life and must identify one element/natural resource used in the technology. Students must then identify where this resource is located and where it is consumed. Students research how it the resource is extracted/mined/harvested and do calculations related to the energy and power needed for these processes. This allows students to draw connections between areas where extraction occurs and areas where consumption occurs and to understand the various methods of extraction and their requirements of human and/or fossil fuel energies.

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)*

Relevant course Learning Outcomes:
- Analyze trends and impacts of cultural systems, natural resource availability and technology access globally on engineering design processes (particularly problem definition and identification of constraints)

Students read: Hess, J. L., & Strobel, J. (2013). Indigenous Ways of Doing: Synthesizing the Literature on Ethno-Engineering. International Journal of Engineering, Social Justice, and Peace, 2(2), 55-80. https://doi.org/10.24908/ijesjp.v2i2.4333 and analyze the authors positionality statements and the concepts of Ethno-Engineering.

Students review and answer questions related to the Food and Agriculture Organization (FAO) of the United Nation's knowledge, attitudes and practices survey of farmer's experiences and willingness to use various fertilizers and animal medicines.

Students prepare a final project requiring synthesis of five or more peer-reviewed sources to explore a topic of particular interest to the student related to Sustainability and Humanitarian Engineering.

Students read and present a review on scholarly articles related to Humanitarian Engineering, including the following subset related directly to the Sustainability theme:

Udomkun, Patchimaporn; Romuli, Sebastian; Schock, Steffen; Mahayothee, Busarakorn; Sartas, Murat; Wossen, Tesfamicheal; Njukwe, Emmanuel; Vanlauwe, Bernard; Müller, Joachim. Review of solar dryers for agricultural products in Asia and Africa: An innovation landscape approach. Journal of Environmental Management, ISSN: 0301-4797, Vol: 268, Page: 110730.

Beers, Karim. 2014. "Analyzing the potential of community water systems: the case of AguaClara". Water Policy (1366-7017), 16 (3), p. 557.

T. M. Ngasala, S. J. Masten, C. Cohen, D. Ravitz, E. J. Mwita; Implementation of point-of-use water treatment methods in a rural Tanzanian community: a case study. Journal of Water, Sanitation and Hygiene for Development 1 December 2020; 10 (4): 1012–1018. doi: https://doi.org/10.2166/washdev.2020.141

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Roxburgh H, Hampshire K, Kaliwo T, Tilley EA, Oliver DM, Quilliam RS (2020) Power, danger, and secrecy—A socio-cultural examination of menstrual waste management in urban Malawi. PLoS ONE 15(6): e0235339. https://doi.org/ 10.1371/journal.pone.0235339

Prachuab Peerapong, Bundit Limmeechokchai, Optimal electricity development by increasing solar resources in diesel-based micro grid of island society in Thailand, Energy Reports, Volume 3, 2017, Pages 1-13, ISSN 2352-4847, https://doi.org/10.1016/j.egyr.2016.11.001.

Champion, W. M., Montoya, L. D., Charley, P. H., Klein, B., Stewart, K., & Solomon, P. A. (2018). Perception, culture, and science: a framework to identify in-home heating options to improve indoor air quality in the Navajo Nation. Science of the Total Environment, 580, 297–306. https://doi.org/10.1016/j.scitotenv.2018.02.182

Cortes, Gustavo. 10/2016. "Full-Scale Test of Transitional Wood Shelter used by Victims of Typhoon Haiyan." Journal of Wind Engineering and Industrial Aerodynamics 157: 15-22. doi:10.1016/j.jweia.2016.08.002.

Yasmin, N., & Grundmann, P. (2020). Home-cooked energy transitions: Women empowerment and biogas-based cooking technology in Pakistan. Energy Policy, 137. https://doi-org.proxy.lib.ohio-state.edu/10.1016/j.enpol.2019.111074

Course subject & number FABE 3210

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)*

Relevant course Learning Outcome:
- Analyze trends and impacts of cultural systems, natural resource availability and technology access globally on engineering design processes (particularly problem definition and identification of constraints)

Students identify trends in colonization globally and indicate independence timelines for various countries

Students track the processes used to obtain specific natural resources and tie this to the power structures between export and import nations

Students read about and describe the concept of ethno-engineering

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)*

Relevant course Learning Outcome:
- Utilize self-reflection techniques for processing new experiences

Students reflect on readings and thier responses to and engagement with the material. Reading topics include the failure of cookstove technology to meet air quality standards, refugee innovations and ancient water harvesting techniques.

Students reflect on guest speakers' experiences working in water, sanitation, sustainable energy and agricultural fields. They review how this aligns or does not align with their own experiences and goals.

Students prepare a final project requiring synthesis of five or more peer-reviewed sources to explore a topic of particular interest to the student related to Sustainability and Humanitarian Engineering.

Students critique peer-reviewed published articles on topics of community engaged development to understand and reflect on the long-term impacts of engineering projects.

Course subject & number FABE 3210

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)*

Students complete an activity where they take an item used in daily life and must identify one element/natural resource used in the technology. Students must then identify where this resource is located and where it is consumed. Students research how it the resource is extracted/mined/harvested and do calculations related to the energy and power needed for these processes. This allows students to draw connections between areas where extraction occurs and areas where consumption occurs and to understand the various methods of extraction and their requirements of human and/or fossil fuel energies. (Resources: Natural and Technical)

Course subject & number FABE 3210

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)*

Students complete two activities where they review various photographic and video footage of people's day to day lives in a variety of locations around the globe. Students are asked to identify variations in human/environment interaction in these sources. Students reflect on the impacts of technology on lifestyle and human/environment interaction. (Day in the Life and Gapminder)

Students learn about colonization through activities identifying the year of independence for various countries and form which country they gained independence (Independence Timelines).

Students listen and respond to lecture content and podcasts relaying the history of colonization in different parts of the world, including South America, Southeast Asia and the African continent and ongoing impacts. (Imperialism, Colonization and Decolonization)

Several times throughout the semester, students read a peer-reviewed journal article pertaining to humanitarian engineering and, with a partner, give a 10 minute review presentation of the article. Articles cover topics of technology design, impacts of technology on communities, frameworks for engaging communities in co-design. Topics covered include disaster relief shelters, improved garbage collectors, solar power, menstrual sanitation, wastewater treatment, drinking water treatment, communication devices, food preservation techniques and more.

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)*

Students write several reflection responses after 1) reviewing articles related to health impacts and failed attempts at altering cooking technologies, 2) innovations within refugee communities and 3) tracking their water use for several days and learning about ancient water collecting techniques. (Reflection Assignments 1-3)

Students write a statement about their perception of the value of acknowledging ones own perspective on a research topic, describe their own perspectives of engineering and explore their own knowledge of place after reading: Hess, Justin and Strobel, Johannes. 2013. Indigenous Ways of Doing: Synthesizing Scholarly Literature on Ethno-Engineering. International Journal of Engineering, Social Justice and Peace, 2 (2): 55-80. (Ethno-Engineering)

Several times throughout the semester, students read a peer-reviewed journal article pertaining to humanitarian engineering and, with a partner, give a 10 minute review presentation of the article. Articles cover topics of technology design, impacts of technology on communities, frameworks for engaging communities in co-design. Topics covered include disaster relief shelters, improved garbage collectors, solar power, menstrual sanitation, wastewater treatment, drinking water treatment, communication devices, food preservation techniques and more.

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 FABE 3210&3211

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)*

Students complete an activity where they take an item used in daily life and must identify one element/natural resource used in the technology. Students must then identify where this resource is located and where it is consumed. Students research how it the resource is extracted/mined/harvested and do calculations related to the energy and power needed for these processes. This allows students to draw connections between areas where extraction occurs and areas where consumption occurs and to understand the various methods of extraction and their requirements of human and/or fossil fuel energies.

Students read Hess, J. L., & Strobel, J. (2013). Indigenous Ways of Doing: Synthesizing the Literature on Ethno-Engineering. International Journal of Engineering, Social Justice, and Peace, 2(2), 55-80. https://doi.org/10.24908/ijesjp.v2i2.4333 and analyze the authors positionality statements and the concepts of Ethno-Engineering.

Students watch the documentary "Living on One Dollar" and analyze and reflect on central aspects of the film.

Students read about hand washing stations via the IBM-WASH framework in Hulland, K.R., Leontsini, E., Dreibelbis, R. et al. Designing a handwashing station for infrastructure-restricted communities in Bangladesh using the integrated behavioural model for water, sanitation and hygiene interventions (IBM-WASH). BMC Public Health 13, 877 (2013). https://doi.org/10.1186/1471-2458-13-877 and discussing in class.

Students review and answer questions related to the Food and Agriculture Organization (FAO) of the United Nation's knowledge, attitudes and practices survey of farmer's experiences and willingness to use various fertilizers and animal medicines.

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)*

Over the course of the semester students engage in several activities to practice participatory development techniques and to build empathy with people in low technological resource settings. These results in an integrative synthesis when the students approach a example community (data provided) and must develop an appropriate participatory development procedure.

In the lecture, students begin work on a research paper by the 4th week of the semester. This paper takes topics discussed throughout the semester and applies them to a single topic/theme/geographic location within the Humanitarian Engineering field. This allows for a deep analysis and synthesis of the approaches and perspectives discussed in the course.

The lenses used to approach the topics will include principles of ecology, biology, water management, cultural competency and design. These various frameworks will be used to review course content focused on community development engineering.

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)*

Students work with peers to review peer-reviewed journal articles that explore community development projects with an engineering approach. The value and quality of the work done is discussed within small groups and the review is presented to the class.

Students meet with faculty on a weekly basis in small groups to discuss the various perspectives on whichever aspect of development is the focus of that weeks in class, including; human/environment interaction, natural and technological resources, colonization impacts, participatory development, social impact companies, etc.

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)*

Students will receive feedback on weekly assignments within 7 days of submission.

Students will integrate concepts from course lectures and assignments to coalesce in the final project.

Students will receive feedback from both professors with their unique disciplinary perspective over the course of the semester on long-term projects; including final research papers.

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)*

In lecture, six assignments throughout the semester require the students to a) read text relating to humanitarian engineering projects, b) reflect on their intellectual and emotional responses to the reading and c) discuss the applications of these responses to their future academic or professional careers.

After each lab, students complete a post-lab assignment. The post-lab includes questions that allow the students to reflect on and integrate learnings from the previous lab session. Discussions are had in lab regularly on the students reflections on the activity to allow students to construct a more comprehensive perspective on the issue and hear both their own and their classmates insights.

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)*

All reviewed research articles are "real-world" examples of Humanitarian Engineering published over the past 20 years.

Students explore the "day in the life" section on Gapminder, which shows images of real-world people and contextualizes some of the development perspectives discussed.

The faculty discuss "real-world" experiences in the field of Humanitarian Engineering and draw a line between course content and contemporary global issues.

"Real-world" data sets from published literature that interviewed communities directly are used for homework and lab assignments related to community interaction and participatory development.

Students gain hands-on insight into Humanitarian Engineering technologies through interactive lab session.

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)*

Students will be required to create a poster of their project work that will be displayed in the Humanitarian Engineering Innovation Lab.

Students are required to present their final projects in an open forum presentation

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)*

Students will learn and integrate cultural competence through instruction related to the Global Competency Certificate and AFS related curriculum. Students will take the IDI assessment and meet with IDI professional to review their results.

Students will learn and assess the role of empathy within engineering context and how empathy can be integrated into the problem solving process. This will be accomplished through assignments including Gapminder, Day in the Life, watching and reflecting on "Living on One Dollar" and reading Hess, J. L., & Strobel, J. (2013). Indigenous Ways of Doing: Synthesizing the Literature on Ethno-Engineering. International Journal of Engineering, Social Justice, and Peace, 2(2), 55-80. https://doi.org/10.24908/ijesjp.v2i2.4333 and analyze the authors positionality statements and the concepts of Ethno-Engineering.

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)*

Students will reflect on their own cultural positionality through various cross cultural activities design to gain insight into similarities and differences amongst culturally diverse groups to effectively bridge differences. This will occur through writing individual positionality statements and sharing with classmates. Students will take the IDI assessment and meet with IDI professional to review their results.

Students will learn the Human Centered Design process. Lecture will encompass the Human Centered Design process. Students will read:The Field Guide to Human Centered Design (IDEO, 2015) and discuss the principles utilized. Students will engage with the process by assessing a domestic engineering project process as a group during class.

3+1 structure allows students to select which General Education course credit hours best meet their scheduling needs.

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)*

Humanitarian engineering courses and minor statistically are comprised of a higher percentage of women and underrepresented minority students when compared to traditional courses within the College of Engineering. This course will serve as an introductory course to Humanitarian Engineering and is a part of an ongoing effort to make the coursework more accessible and easily integrated into the academic pathways of students from multiple colleges and departments. This course will aid in building cohesion and community amongst students interested in using their unique skillsets to collaborate on challenging global issues.

This course will be advertised by partnering with the College of Engineering's Office of Diversity, Outreach and Inclusion and CFAES's Office of Diversity, Equity and Inclusion.

Instructors will attend various on-campus student groups representing underserved populations to discuss and promote the course.

Week	Class (3210)	Laboratory Experiences (3211)	Interdisciplinary Learning Outcome	Patrick Lead	Kristen Lead
Week 1	How do engineering and sustainability fit in to humanitarian work? Valuing differing perspective and intercultural skillsets	Introduction: What is Humanitarian and Development Innovation and how does engineering fit in?	Engage in critical thinking about sustainability and humanitarian / global engineering	X	X
Week 2	Current research in Humanitarian Engineering and how to approach the literature	Gathering our water	Engage in an advanced, in depth, scholarly exploration of Humanitarian Engineering and sustainability research (this will be supported throughout the semester by use of these skills in Review of Research Paper assignments)	X	
Week 3	Global trends in human/environment interaction Overview of the Intercultural Development Index Overview of Wicked Problems	Treating our water	Develop a sense of self and consider alternative perspectives		X

Week 4	Lifestyle variations and relevance to engineering design Stakeholder Values and Stakeholder Dynamics	Purchasing our land Building our home	Assess the relationships among disciplinary insights relevant to the problem Identifies own and others assumptions relevant to the problem	X	
Week 5	Global trends in natural resource distribution, technology availability, colonization and independence timelines	Selecting our toilet	Understand the interdisciplinary and multidisciplinary context of humanitarian / global engineering Identify the factors and contexts, including natural, social, cultural and political, contributing to an integrative understanding of humanitarian engineering.	X	X
Week 6	Introduction to participatory community development for technology adoption	Hand washing stations	Explain an interdisciplinary understanding as to why community development requires a systems approach		X
Week 7	Case study: Stormwater management - understanding end users and the politics of engineering	Market place decisions at home and abroad Limits to human life	Identify the defining elements of disciplines relevant to the problem Understand the need for interdisciplinary approach Interpret and evaluate information from multiple sources and multiple disciplinary	X	X

			perspectives to develop a comprehensive synthesis		
Week 8	Concept of Human Centered Design and The Engineering for Global Development Framework Individual reflection and processing techniques for designing in the field	Soccer ball designs	Interpret and evaluate information from multiple sources and multiple disciplinary perspectives to develop a comprehensive analysis or synthesis, and thoroughly question the viewpoints of experts and professionals. Articulate a sense of purpose and develop competencies, skills, and habits that prepare them for life-long learning about and engaging with wicked problems.	X	
Week 9	Mapping "Engineering for Good" Career Pathways Career paths/guest panel discussion	Growing our food P1	Understand interdisciplinary career opportunities	X	X
Week 10	Social impact companies	Growing our food P2			X
Week 11	Case study: Agricultural and food systems - investigating the complex social dynamics of these systems.	Making our food Activity Wheel	Identify the defining elements of disciplines relevant to the problem Understand the need for interdisciplinary approach Interpret and evaluate information from multiple sources and multiple disciplinary	X	X

			perspectives to develop a comprehensive synthesis		
Week 12	Case study: Sanitation opportunities and tried solutions	No lab period	Identify the defining elements of disciplines relevant to the problem Understand the need for interdisciplinary approach Interpret and evaluate information from multiple sources and multiple disciplinary perspectives to develop a comprehensive synthesis	X	X
Week 13	Challenges and design for engineering in participatory community development	Design Challenge: TBD (Research)	Systematically and methodically analyze their own and others' assumptions using more than one disciplinary lens and carefully evaluate the relevance of contexts when representing a position. Engage in scholarly literature on Humanitarian Engineering and Sustainability across multiple disciplines	X	
Week 14	Professionals involved in Humanitarian Engineering/Development	Design Challenge: TBD (Design Concepts)	Systematically and methodically analyze their own and others' assumptions using more than one disciplinary lens and carefully evaluate the relevance of contexts when representing a position. Connect, analyze, and extend knowledge (facts, theories, etc.) from course content to integrate their insights through construction of a more comprehensive perspective.		X

Week 15	Final Presentation and Report (A)	Design Presentations		X	X

Interaction between the co-instructors:

Seven weeks of the semester will be co-lead by the instructors to allow for integration of content presented in previous and current sessions. Seven weeks will be led by individual instructors to discuss their disciplinary expertise. (added to Mode of Delivery)

Instructors will share grading duties and base scoring on defined criteria. (added to Grading)

Instructors will meet weekly outside of class to discuss content and review plans for integration lectures.