

BAE 570-001

Engineering Controls for Agricultural Safety and Health Hazards

Semester/Term: **Fall 2023**

Credit Hours: **3 hours**

Meeting Days/Time/Location: **Fridays – 8:30 to 11:00 am
In Classroom, Laboratory, and Field Sites
Classroom 236 Charles E. Barnhart Building**

Instructor Information

Instructor: **Wayne T. Sanderson, PhD, CIH
Professor, Biosystems and Agricultural Engineering**

Office Building & Room Number: **114 C.E. Barnhart Building
1398 Nicholasville Road
Lexington, Kentucky 40546**

Email: wayne.sanderson@uky.edu

Office Phone: **859-218-2227**

Office Hours: **There are no specific office hours, but students are welcome to arrange in person meetings or contact me by telephone or e-mail as needed. I am generally available between 8 am and 5 pm during weekdays.**

Instructor: **Stacy Vincent, PhD
Associate Professor, Community and Leadership Development**

Office Building & Room Number: **505 Garrigus Building
Lexington, KY 40546**

E-mail: stacy.vincent@uky.edu

Office Phone: **859-257-7588**

Office Hours: **By Appointment**

Instructor: **Michael Montross, PhD, PE
Professor and Chair, Biosystems and Agricultural Engineering**

Office Building & Room Number: **128 C.E. Barnhart Building
Lexington, KY 40546**

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Office Phone: **859-218-4319**

Office Hours: **By Appointment**

Course Description

This course addresses engineering and administrative controls of health and safety hazards affecting farmers, members of farm families, hired farm workers, and others who live or work in agricultural environments. The course focuses on health and safety risks associated with crop and livestock production, timber production, and commercial fishing—the occupational groups within the Agricultural Industry Sector. This course addresses how to reduce hazards to prevent injuries and diseases through classroom instruction, laboratory exercises, and visits to agricultural field sites. In this course “engineering controls” refers to measures employed to protect workers by removing hazardous conditions or by placing a barrier between the worker and the hazard.

Course Prerequisites

Undergraduate students must be at least Junior-level standing.

Skill Requirements

No special skills required other than an interest in protecting the health and safety of rural-agricultural people.

Required Materials

No textbook is required for this course. Course handouts, articles and lecture notes will be distributed via Canvas. Required readings from journal articles, manuscripts, and other documents are provided via Canvas. Students are responsible for securing their own copies of the readings and reviewing the materials prior to the class.

Associated Expenses

There are no additional expenses associated with this course.

Activities Outside of Regular Class Meetings

If we are able to conduct field exercises in a safe manner, we plan to have four (4) field investigation exercises during the semester. Transportation to these sites can be provided at no charge for the students, or they may transport themselves to the work sites. Additional information will be provided to students about necessary safety equipment and requirements for conducting the site investigation. The site visits will be made on Friday mornings but may last longer than the regularly scheduled class period.

Technology Information and Requirements

Technology Requirements

Minimum technical requirements for UK courses and suggested hardware, software, and internet connections are available at [ITS Student Hardware & Software Guidelines](#). Any additional technology requirements will be provided to the students.

Technical Support

For technical/account help, students can contact Information Technology Services by phone: 859-218-HELP (4357) and via the [ITS Customer Services](#) page.

(<https://www.uky.edu/its/customer-support-student-it-enablement/customer-services>)

Student Learning Outcomes

After completing this course, the student will be able to:

1. Assess health and safety hazards from the perspective of multiple science disciplines while working in teams.
2. Propose potential solutions and control technology for problems based on an understanding of systems theory, essential services, and social, behavioral, environmental, and biological factors that contribute to the problem.
3. Use basic terminology and definitions associated with assessing the health and safety hazards and engineering controls.
4. Identify sources of data for answering key questions and conducting research.
5. Develop computational skills to conduct experiments to test hypotheses to control hazards and analyze and interpret data to evaluate the effectiveness of control measures.
6. Use evidence-based principles and scientific knowledge effectively to guide decision-making.
7. Evaluate the study design and strengths and limitations of using scientific reports for guiding hazard control measures.
8. Describe the federal and state regulatory programs, guidelines, and authorities that and advise health and safety.
9. Consider human factors that affect susceptibility to safety and health hazards.
10. Explain approaches for assessing, preventing, and controlling agricultural hazards that pose risks to health and safety.
11. Propose engineering, educational, policy and enforcement strategies that reduce agricultural safety and health risks.
12. Summarize the role of policy, regulation, and enforcement to prevent, modify, and remove agricultural hazards.
13. Demonstrate basic ethical and legal principles pertaining to the collection, maintenance, use and dissemination of scientific data.

ABET Student Outcomes:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

Activities and Assignments

Course Assignments for Undergraduate Students

The course will consist of seminar/discussion classes, lectures, and self-study. Undergraduate Students will be required to complete four problem sets (25 points each; 100 points total); four field hazard control evaluation and implementation exercises associated with field trips to agricultural work sites (25 points each; 100 points total). There will also be a mid-term (75 points) and final examination (75 points). **Total points = 350.** The homework problem sets will cover multiple class meetings and will prepare the students for the examinations. The site visit

exercises will largely be completed in the field while working as interdisciplinary teams. The teams will include both undergraduate and graduate students working together.

Assignments and Tests for Undergraduate Students	Points
Homework Problem Sets: 4 at 25 points each	100
Site Visit Exercises: 4 at 25 points each	100
Mid-term Examination	75
Final Examination	75
TOTAL	350

Course Assignments for Graduate Students

The course will consist of seminar/discussion classes, lectures, and self-study. Students will be required to complete four problem sets (50 points each; 200 points total); four field hazard control evaluation and implementation exercises associated with field trips to agricultural work sites (25 points each; 100 points total). There will also be a mid-term (100 points) and final examination (100 points). **Total points = 500.** The homework problem sets will cover multiple class meetings and will prepare the students for the examinations. The graduate students will have more questions (additional 25 points on each problem set) than the undergraduate students. The site visit exercises will largely be completed in the field while working as interdisciplinary teams. The teams will include both undergraduate and graduate students working together. The graduate students will also have more questions on the Midterm and Final examinations than the undergraduate students.

Assignments and Tests for Graduate Students	Points
Homework Problem Sets: 4 at 50 points each	200
Site Visit Exercises: 4 at 25 points each	100
Mid-term Examination	100
Final Examination	100
TOTAL	500

Summary Description of Course Assignments

Students are required to participate in discussions on agricultural hazards and methods of control during class meetings. This requires them to be well prepared in having read the assigned literature and completed the homework assignments or other activities for generating discussion. A presentation of major issues, controversies, or basic information on a wide variety of agricultural hazards will be presented to the class. However, most of the classroom time will be spent in interactive discussion with the professor questioning and the student answering, or learning skills in the classroom, field, or laboratory. While students are expected participate in class discussions, they are not provided a point score for participation.

The problem sets assignments involve literature research, evaluation or research findings, and applied computations relevant to agricultural hazard topics. The assignments must be completed and handed in on the due date. Problem sets will generally be assigned such that students have approximately two weeks to complete them. The assignments must be the student's own work (i.e. each student must turn in a completed assignment), but students are encouraged and

allowed to work together in solving the problems and assisting each other with the exercises. Problem sets will be concerned with determining hazards and assessing or implementing control measures at agricultural work sites.

The site visit exercises involve evaluation of the hazards present at the selected worksites as well as an evaluation of the control measures being used to prevent injuries and diseases. The questions to be answered in these exercises are based upon material presented during lectures and skills developed through completing the assigned problem sets. The assignments must be completed and handed in on the due date with students having approximately two weeks to complete them. The assignments must be the student's own work (i.e. each student must turn in a completed assignment), but students are encouraged and allowed to work together in solving the problems and assisting each other with the exercises. However, these exercises may largely be completed using information available at the field sites and performing on site measurements and calculations. The Problem sets will be concerned with determining hazards and assessing or implementing control measures at agricultural work sites.

Submission of Assignments

Assignments are to be sent to the instructor on the due date as an e-mail attachment or may be given to the instructor in-person.

Course Grading

Undergraduate student letter grades for the course will be assigned on a percentage basis (as given below) for the student's total score as a percentage of the total number of points possible for the course.

Grade	%	# Points
A	90-100	≥315
B	80-89	280 – 314
C	70-79	245 – 279
D	65-69	227 – 244
E	<65	<227

Graduate Student letter grades for the course will be assigned on a percentage basis (as given below) for the student's total score as a percentage of the total number of points possible for the course.

Grade	%	# Points
A	90-100	≥450
B	80-89	400 – 449
C	70-79	350 – 399
E	≤ 69	<350

Classroom Behavior Policies

1. I expect you to be prepared to begin work at the scheduled starting time for each session.
2. I expect you to actively participate in the discussions. This is not the type of class where you can "sit back and listen."

3. I expect you to submit papers using proper English grammar, syntax, and spelling. You are encouraged to use spell check and grammar check prior to submitting your written work. The Writing Laboratory is available to anyone who may need assistance. Grammar, syntax, and spelling will account for 10% of the grade for written work.
4. I expect (and encourage) you to provide honest and timely feedback regarding the content and process of this course throughout the semester.
5. I expect you to share in the responsibility for making this course an enjoyable and beneficial learning experience.

Academic Policies

Please refer to the following website regarding Academic Policies for:

- Excused Absences and Acceptable Excuses
- Religious Observances
- Verification of Absences
- Make-Up Work
- Excused Absences for Military Duties
- Unexcused Absences
- Prep Week and Reading Days
- Accommodation Due to Disability
- Non-Discrimination Statement and Title IX Information
- Regular and Substantive Interactions

<https://www.uky.edu/universitysenate/acadpolicy>

Academic Offenses for Undergraduate and Graduate Students

Please refer to the following website for regarding policies for:

- Plagiarism
- Cheating
- Misuse of Academic Records

<https://www.uky.edu/universitysenate/ao>

Mask and Social Distancing Policy

This course will comply with the current University of Kentucky Covid-19 protocols and guidelines (www.uky.edu/coronavirus).

Counseling Center

The UK Counseling Center (UKCC) provides a range of confidential psychological services to students enrolled in 6 credit hours or more, psychoeducational outreach programming (including QPR suicide prevention), and consultation to members of the UK community (students, faculty, staff, administrators, parents, concerned others). Please visit the website <https://www.uky.edu/counselingcenter/> for more detailed information, or call 859.257.8701.

Syllabus Statement on Diversity, Equity, and Inclusion (DEI)

The University of Kentucky is committed to our core values of diversity and inclusion, mutual respect and human dignity, and a sense of community ([Governing Regulations XIV](#)). We acknowledge and respect the seen and unseen diverse identities and experiences of all members of the university community (<https://www.uky.edu/regs/gr14>). These identities include but are not limited to those based on race, ethnicity, gender identity and expressions, ideas and perspectives, religious and cultural beliefs, sexual orientation, national origin, age, ability, and socioeconomic status. We are committed to equity and justice and providing a learning and engaging community in which every member is engaged, heard, and valued.

We strive to rectify and change behavior that is inconsistent with our principles and commitment to diversity, equity, and inclusion. If students encounter such behavior in a course, they are encouraged to speak with the instructor of record and/or the [Office of Institutional Equity and Equal Opportunity](#). Students may also contact a faculty member within the department, program director, the director of undergraduate or graduate studies, the department chair, any college administrator, or the dean. All of these individuals are mandatory reporters under University policies.

Syllabus Statement on Generative AI Tools (e.g., ChatGPT)

For most assignments in this course, the use of GenAI to complete any part of the submitted work is prohibited unless explicitly specified by the instructor. In instances where specific instruction/permission to use GenAI tools are provided, students must acknowledge any work that is not their own. This includes citations for outside scholarship or information gathered from other sources. If you have any questions or concerns about this policy, contact your instructor before submitting any assignments.¹

Tentative Course Schedule

Class	Month	Date	Topic	Site Visits /Problem Sets
1	Aug	25	Overview of the Hazards on Agricultural Operations – Who is at Risk? (Sanderson and Viincent)	
2	Sep	1	Exposure Assessment of Dust, Gas, Bioaerosols, and Agricultural Chemicals	
3	Sep	8	Controlling Physical Agents – Noise, Heat, Cold, and Radiation	
4	Sep	15	Agricultural Machinery Hazard Controls – ROPS, Lighting, Marking, Maintenance	Problem Set 1 Due Sep. 15
5	Sep	22	Site Visit Stateland Dairy Farm Eastern Kentucky University	Site Visit #1
6	Sep	29	Ventilation and Personal Protection to Prevent Respiratory Diseases	Problem Set 2 Due Oct. 6
7	Oct	6	Preventing Grain Harvesting and Handling Health and Safety Related Injuries and Diseases (Montross)	Site Visit #2
8	Oct	13	Assessing and Controlling Infectious Diseases – Zoonoses (Sanderson) Mid-Term Examination	
9	Oct	20	Cancer and Chronic Disease Risks for Aging Agricultural Populations – Agribility	
10	Oct	27	Skin Diseases and Use of Personal Protective Equipment	Problem Set 3 Due Oct. 27
11	Nov	3	Controlling Health and Safety Hazards in the Timber Industry	Site Visit #3
12	Nov	10	Water Quality Issues Associated with Agriculture (Messer)	
13	Nov	14 Tues	Best Practices and Engineering Design to Prevent Animal-Related Injuries (Jackson and Hayes)	Site Visit #4
--	Nov	24	Thanksgiving Break – No Class	
14	Dec	1	Social Concerns, Emerging Issues, and Future Research	Problem Set 4 Due Dec. 1
15	Dec	8	Reading Day – No Class	
16	Dec	12	Take Home Final Examination Due	

The lecture schedule and due dates for the Problem Sets are subject to change depending on the schedules of faculty and the progress of the course. Students will be given notice in the event of a change in the schedule.

Final Exam Information

The final examination will be a take-home hazard assessment and control measure design examination which will be due on December 10, 2021.