

HRT 486 / PHL 486 / CSS 486 / FOR 486
Biotechnology in Agriculture: Applications and Ethical Issues
(3 Credit hours)
(Fall 2024)
Natural Resources Building, Room 1

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Class meets Tuesdays & Thursdays 10:20 – 11:40 am in Natural Resources, Room 1.
Office hours are directly after class or by appointment with either instructor. **(Please email our regular MSU email addresses not our D2L email to schedule an appointment)**

COURSE DESCRIPTION

HRT/PHL/CSS/FOR 486 will introduce students to the philosophical field of agricultural bioethics, both in theory and in practical application to contemporary issues. The present course is beneficial for a wide range of majors. It develops critical thinking, reading, writing, and argumentative skills that can be useful for those interested in building better arguments, improving clarity of thought, and understanding the often complex issues involved in bioethical debates in agriculture and technology. These skills provide the means by which to resolve unanticipated problems whose solution does not seem immediately obvious but requires action in an environment of uncertainty. The course requires students to practice reading, understanding, and critically analyzing both scientific and philosophical papers in science and technology.

AIMS OF THE COURSE

In this course we will explore ethical challenges arising as a result of recent biotechnology research and uses of emerging biotechnology applications in agriculture. Lectures will emphasize the scientific basis for underlying technologies as well as the ethical implications and considerations that arise in the research, development, and use of specific applications. Students will learn two sets of tools: the mechanisms of biochemistry, genomics, and synthetic biology, and the fundamental principles in ethical theory such as utilitarianism, moral rules and codes, social contracts, rights and obligations, cultural relativism, and virtue ethics. Guest lectures provide expert workshops where these skill sets come together in the pursuit of biotechnology applications in plant, soil, and animal sciences. Active, student-centered discussions complement the lectures and reading. These discussions will be problem-based learning sessions where these two sets of tools are employed using practical, real-life cases.

INTENDED LEARNING OUTCOMES

HRT/PHL/CSS/FOR 486 has two core sets of aims. First, it seeks to introduce students to current ethical issues in agricultural biotechnology and to begin critical reflection about these issues by focusing on specific biotechnological applications. Second, HRT/PHL/CSS/FOR 486

aims to provide students with tools from moral philosophy useful for the development, defence, criticism, and extension of particular moral decisions surrounding the development and use of agricultural biotechnologies. When confronted with ethical challenges in the future, students will have a basic framework for sound, reflective engagement, and responsive problem-solving.

Contributing to an undergraduate degree, HRT/PHL/CSS/FOR 486 has these aims:

1. Improve knowledge of main schools of moral philosophy, their strengths and weaknesses
2. Refine student's ability to express and defend ethical views
3. Refine student's ability to use these views when faced with a problem or dilemma arising with the use of biotechnological applications in agriculture
4. Provide experience with research-led learning that will improve student's ability to think clearly and write concise, well-focused analytic essays.

Upon completion of the course, students will be able to:

5. Identify ethical dimensions of research and applications of current biotechnologies in agriculture
6. Relate those ethical dimensions to main schools of moral philosophy
7. Identify key points in those main schools
8. Identify and present a justified ethical position when faced with decisions about current or future biotechnological research and applications
9. Prepare succinct and detailed arguments

As a philosophy-oriented course, HRT/PHL/CSS/FOR 486 also seeks to develop general skills in analytical thinking and clear critical argumentation. By the end of the course, students also should be able to:

10. Demonstrate basic skills in philosophy which include assessing arguments, identifying underlying unstated assumptions, and evaluating the reliability of claims,
11. Appropriately and critically utilize ethical theories, and apply these to a wide range of practical, real-life situations
12. Articulate the basic philosophical dimensions to problems engaged in this course
13. Identify basic principles of moral philosophy
14. Combine mastery of these above skills to novel case studies and conceptual problems.

ASSESSMENT

There are six different types of assessment for this course:

To pass this course **ALL** of these must be completed:

1. Class participation: Regular and competent participation in class discussions: 10%
2. Midterm 1: Assessment of your competence in biochemistry, genomics and the basic science employed in biotechnological research in agriculture as presented in the first third of the course: 25%
3. Midterm 2: Assessment of your ability to describe, identify and apply ethical theories: presented in the second third of the course 25%
4. In-class group activity A: 5%
5. In-class group activity B: 5%
6. Final: 30%

SESSION STRUCTURE

In the first third of the course, there will be a lecture and opportunity for questions and discussion focused on the scientific research used in biotechnology development of genetics,

breeding, and bioengineering techniques. Lectures and discussions in the second third of the course will each focus on a presentation of an ethical theory, basic moral issues to be discussed, and applications of an ethical theory to a current problem in biotechnology. In the final third of the course, guest scientists in plant and animal sciences will give expert workshops on real life examples of their research and biotechnology applications. Structured discussions that rely on class readings and the expert's talks will form the basis of these. For all the discussions throughout the course, students will be required to discuss the topic for that week's seminar. Discussions will develop particularly topical case studies and debates including the development of cell-cultured meat, use of biotechnologies in potato and teff cultivation, alternative protein and meat development, soil health management, and synthetic milk production. It is a requirement of the course that students attend seminars having read and reflected on relevant sections of the required readings and are prepared to actively participate in the discussions. Remember that class participation in seminar discussions and critical reflection make up 10% of your grade.

READING MATERIALS

The texts that are required reading for this course:

- James Rachels and Stuart Rachels. *The Elements of Moral Philosophy*, (New York: McGraw-Hill). (any edition from 6th onwards). The newest edition is available at the university bookstore.
- Scientific and philosophical journal articles assigned on the syllabus are available through our D2L site.

CLASS SCHEDULE

Tuesday & Thursday
10:20am – 11:40 am

Date	Day	Class #	Topic
8/27	Tu	1	Welcome and introduction to the class – Dr. Barry & Dr. Kendig
8/29	Th	2	Genetics & Breeding – Dr. Barry
9/3	Tu	3	Genes to proteins – Dr. Barry
9/5	Th	4	Production of genetically engineered plants – Dr. Barry
9/10	Tu	5	Genetically Engineered Crops on the market – Dr. Barry
9/12	Th	6	Gene Editing in Plants – De novo domestication? – Dr. Barry
9/17	Tu	7	Midterm 1
9/19	Th	8	The challenge of cultural relativism – Dr. Kendig
9/24	Tu	9	The Utilitarianism approach – Dr. Kendig
9/26	Th	10	Intro to Synthetic biology in agriculture – Dr. Barry
10/1	Tu	11	Rights and Obligations – Dr. Kendig
10/3	Th	12	Are there absolute moral rules? – Dr. Kendig
10/8	Tu	13	Virtue Ethics – Dr. Kendig
10/10	Th	14	Midterm 2
10/15	Tu	15	Dr. Jongyuoo Kim – Cell cultured meat. Synthetic Biology in

			Agriculture
10/17	Th	16	Fish. Food safety of GMOs? Environmental safety of GMOs AquaBounty salmon – Dr. Barry
10/22	Tu		No Class – MSU Fall break
10/24	Th	17	Dr. Bob Van Buren – biotechnology for the improvement of Teff
10/29	Tu	18	Dr. Dave Douches – Potato Biotechnology in Africa
10/31	Th	19	Milk. Synthetic Biology in Agriculture – Introduction to cow-less dairy products and plant-based milk – Dr. Kendig & Dr. Barry **In class group activity A
11/5	Tu	20	Dr. Eric Hegg – Biofuels
11/7	Th	21	Meat. Alternative meats & new proteins – Dr. Barry and Dr. Kendig **In class group activity B
11/12	Tu	22	Dr. Janice Siegford – Intro to Animal Agriculture and animal welfare
11/14	Th	23	Dr. Jason Knott – Animal Cloning, Transgenic Animals & Gene Editing
11/19	Tu	24	Dr. Jason Knott – Animal Production for Vaccines and Xenotransplantation
11/21	Th	25	Dr. Wen Huang – Genomic Selection in Animal Breeding
11/26	Tu	26	Can biotech solve the nitrogen dilemma – Dr. Kendig **Questions for final exam will be disseminated
11/28	Th		No Class - Thanksgiving
12/3	Tu	27	Study day – Class will not officially meet but instructors will be available to answer questions
12/5	Th	28	Final exam – The final will be a comprehensive, in class essay exam

UNIVERSITY AND CLASS EXPECTATIONS

PARTICIPATION AND ENGAGEMENT

During all classes, the instructors expect students to be fully engaged and prepared to discuss reading assignments. Students are encouraged to ask questions of the instructor, guest speakers, and their peers.

Active participation includes, but is not limited to, the following:

1. Participating in small group discussions and activities
2. Bringing forth new ideas, information, or perspectives to academic conversations
3. Discussing your readings and reflections with instructors and peers in class discussions
4. Questioning information presented and discussed
5. Asking and answering questions of the instructors, peers, or guest speakers

CLASS ATTENDANCE

Your participation in class discussions contributes significantly to your learning and to your overall grade. Obviously, you can only participate in class discussions if you regularly attend class. Therefore, we urge you not to miss more than 6 absences this semester as it will be detrimental to your learning and performance.

There is a well-established correlation between attendance in class and the grade achieved. There is a high likelihood that if you miss lots of classes and fail to complete assignments, that your grade will be low. If you have a valid reason for missing class and you know of this in advance or if you are ill, please let us know by email so that we are aware of the situation. MSU

has a Grief Absence Policy that must be followed in the event of family bereavement. Details are available at <https://reg.msu.edu/ROInfo/Notices/GriefAbsence.aspx>

UNIVERSITY ATTENDANCE POLICY

REPORTING NON-ATTENDANCE. In compliance with federal regulations *governing financial aid* and veterans education benefits, *instructors are required to report students who stop attending or who have never attended class.* After the first week of classes, through the middle of the term of instruction, instructors who identify a non-attending student should notify their departmental office. Upon receiving a report of non-attendance, *departmental representatives are encouraged to initiate an administrative drop.*

"Attendance" is defined as physical attendance or participation in an academically related activity such as submission of an assignment, an examination, participation in a study group or an online discussion, etc. Instructors who do not take attendance may utilize key assessment points (e.g. projects, papers, mid-term exams, and discussions) as benchmarks for participation.

DROP FOR NON-ATTENDANCE. Students may be dropped from a course for non-attendance by a departmental administrative drop any time after the fourth class period, or the fifth class day of the term of instruction, whichever occurs first.

GENERAL EVALUATION CRITERIA*

Essay exams and written in-class assessments will be evaluated on the basis of the following criteria.

- a) *Clarity and precision* The central claims should be stated precisely and presented in a manner that another student who was interested in the topic, but not enrolled in the course, could understand. Frequent spelling and grammatical errors are distracting, and will lower your grade. Clear and concise prose is of the utmost importance. The more people that read your work and think that it makes sense, the more likely it does make sense. Remember: we are reading what you write very closely and with a critical eye. Say what you mean and mean what you say. Be careful!
- b) *Depth and Persuasiveness* How insightful are the central claims of the essay, and how persuasive are the arguments given in support of them? Your arguments should at the very least provide plausible support for their conclusions. Also, the arguments should be consistent with one another. Important concepts and terms should be clarified. Generally, the more insightful and careful the essay's central claims, and the stronger their support, the better the paper.
- c) *Breadth of knowledge* Have you made good use of the relevant concepts, distinctions, and arguments **that have been included in the assigned readings or that were brought out in classroom discussion?** For example, where one of your central claims clearly contradicts a thesis in one of the reading assignments you should explain what is wrong with the opposing position. (*adopted from M. McKeon, Spring 2009)

4 Point Scale to Percentage Conversion Key.

Your final grade will be converted to 4-point scale as follows:

4.0 = 92—100%
3.5 = 87—91%
3.0 = 80—86%
2.5 = 75—79%
2.0 = 70—74%
1.5 = 65—69%
1.0 = 50—64%
0.0 = 0—49%

The Meaning of Grades**

4.0 =excellent work

"4.0" assignments are of exceptionally high quality. They are innovative, adding something to the topic. They are accurate, clear, organized, use compelling reasoning, and possess a spark of innovation/creativity. They show depth of thought and the writing is polished.

3.0= good work

"3.0" assignments meet the expectations of the assignment and are accurate, clear and organized. They contain good reasoning and although they do not have any significant problems, they do not add anything to the topic.

2.0= acceptable work that has significant problems

"2.0" assignments contain inaccuracies or significant problems with reasoning, organization, or quality of writing.

1.0 work has serious problems and is unacceptable as college-level work.

0.0 is normally reserved for work that is not turned in, is borderline unintelligible, or has little or no relevance to the assignment. (***)adopted from Hedrick 2010)

CLASSROOM COURTESY

Be nice. Respect yourself and each other. We want you to be bold, argumentative, and challenging—but in an open-minded and thoughtful way. You will disagree with each other. Being respectful doesn't mean you have to agree with each other, it just means you are willing to listen to each other.

Please arrive to class on time. All mobile phones must be turned off during class time (this includes discussion sessions unless explicitly allowed by us). Do not text, use your phones or other electronics in class. If you do so you will be asked to leave.

MSU EMAIL COMMUNICATION

All communication will be through your MSU email. Please refer to Student Rights and Responsibility (<https://www.msu.edu/~ombud/index.html>) .

COURSE MANAGEMENT SYSTEM: *Desire to Learn (D2L)*

Syllabus, reading materials, PowerPoints, and announcements are available on Desire to Learn (D2L). It is your responsibility to understand how to use *Desire to Learn*. Help is available at: http://learndat.tech.msu.edu/communicate_guide/ Instructions for technical assistance for *Desire to Learn* at: <https://d2l.msu.edu> or 355.2345 or 1-800-500-1554

ACADEMIC HONESTY

Do not cheat.
Do not plagiarize.
Cite your sources.

If it is not your work, then you need to properly cite your sources. Submitting another's work as your own—either in part or in whole—counts as plagiarism. Penalty for plagiarism is a zero on the assignment. Just to be clear, submitting another's work as your own counts as plagiarism whether it is another person or generative artificial intelligence (e.g., intelligent agents, chat bots, or any artificial intelligence engines). Do not submit assignments that have been either fully or partially generated by artificial intelligence. It is the policy of this class that you are the creator of all the work you submit.

REMINDERS OF RELEVANT UNIVERSITY POLICIES

Please be aware that MSU prohibits the commercialization of course notes and materials. MSU prohibits students from commercializing their notes of lectures and University-provided class materials without the written consent of the instructor.

ACCOMMODATION REQUESTS

Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at rcpd.msu.edu. Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation ("VISA") form. Please present this form to us at the start of the term and/or two weeks prior to the accommodation date (test, project, etc). Requests received after this date will be honored whenever possible.

UNIVERSITY POLICY ON RELIGIOUS OBSERVANCE

It has always been the policy of the University to permit students and faculty to observe those holidays set aside by their chosen religious faith. The faculty and staff should be sensitive to the observance of these holidays so that students who absent themselves from classes on these days are not seriously disadvantaged. It is the responsibility of those students who wish to be absent to make arrangements in advance with their instructors. Please let us know within one week from the beginning of class if you need to be absent for Observance of a Religious Holiday or Festival. Additional information on this MSU policy can be found at <https://reg.msu.edu/ROInfo/Notices/ReligiousPolicy.aspx>

ADDITIONAL COLLEGE AND UNIVERSITY POLICIES

All other general college and university policies applicable to this course are available at <https://www.canr.msu.edu/academics/courses/policies> . Please review these policies.

NOTIFICATION OF CHANGES, INCLEMENT WEATHER & EMERGENCY PROCEDURES

The schedule of reading is the plan for the course. However, changes may need to be made and so it is tentative and subject to change. Any changes or modifications to the course schedule/syllabus will be announced ahead of time in class. Emergency Procedures: If there is an emergency or there is inclement weather, or other related cancellations, we will follow University policy. Any additional necessary changes will be posted to D2L.

Student Organizations or Clubs	http://studentlife.msu.edu/about-student-life
Learning Resources Center:	355.2363 or http://lrc.msu.edu/

Office of Supportive Services:	353.5210 or http://www.oss.msu.edu
The Writing Center:	http://writing.msu.edu
Libraries:	432.6123 or www.lib.msu.edu/
MSU IT Service Desk:	Help Desk: 432.6200 or www.tech.msu.edu/support/
Office of the Ombudsperson:	353.8830 or www.msu.edu/unit/ombud
Olin Student Health Center:	http://olin.msu.edu/
MSU Counseling Center:	www.counseling.msu.edu
MSU Psychological Clinic:	355.9564
English Language Center:	www.elc.msu.edu
Community groups, for adult students, international students, persons with disabilities, LBGT, family resource center, veterans, women's resource center see <i>Student Handbook & Resource Guide</i> : http://splife.studentlife.msu.edu/information-and-services/services-for-community-groups	