SYLLABUS

Genes and Chemicals in Agriculture: Value and Risk

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Course Number: FES and TOX 435/535 / Term Offered: Spring 2022 / Credits: 3

Meeting times: MWF 9-9:50 AM / Classroom: Richardson Hall 123

Prerequisites: None (one quarter each of biology and chemistry helpful but not essential)

Catalog Course Description**:** A multidisciplinary course that examines the scientific, social, political, economic, environmental, and ethical controversies surrounding agricultural and natural resource biotechnologies. Lec/rec. Cross-listed as as FES 435/TOX 435 and FES 535/TOX 535. (Bacc Core Course)

Bacc Core**:** Satisfies Bacc Core Course in Synthesis category of Science, Technology & Society

Learning resources: All required resources will be online

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CLASS SCHEDULE

Date	Topic	Instructor
28-March	Class organization, review of science (LEC)	Strauss
30-March	Crop domestication and green revolution (LEC) ***(video self-intro & recitation preferences due)***	Strauss
1-April	Of wizards vs. prophets (REC)	Strauss
4-April	Plant genetic engineering: Status and methods (LEC)	Strauss
6-April	New biotech methods: Gene editing and RNAi/HIGS (LEC)	Gordon
8-April	Understanding the diversity of breeding methods (REC)	Strauss
11-April	Integrated, modern breeding to rescue the Chestnut (LEC)	Strauss
13-April	Gene flow and impacts of herbicide tolerant crops (LEC)	Brunharo
15-April	The saga of creeping bentgrass in Oregon (REC) ***(essay topic idea/s emailed by today)***	Strauss
18-April	Toxicology basics/risk assessment for pesticides (LEC)	Buhl
20-April	The controversy over glyphosate/Roundup and cancer	Buhl
22-April	Risk perception (REC)	Strauss/Buhl
25-April	Pollinator health: Pesticides, parasites, and GMOs+ (LEC)	Charkrabarti
27-April	Regulating GMOs (LEC) -- ***(first draft of essay due)***	Strauss
29-April	Food Evolution movie – *view ahead of class* (REC)	Strauss
2-May	Biofortification (LEC)	Nagle
4-May	Patents and intellectual property	Myers
6-May	Vandana Shiva - Ecoleader or charlatan? (REC)	Strauss
9-May	Organic agriculture (LEC)	Strauss
11-May	**Midterm**	Strauss
13-May	Racism/colonialism and biotech (REC)	Strauss
16-May	Food safety regulation and technology (LEC)	Kovacevic
18-May	Dietary supplements and the case of nitrite/ates (LEC)	Hord
20-May	Public vs. scientist credibility / reliability of science (REC) ***(Hot news topic idea/s emailed by today)***	Strauss
23-May	Assessing public attitudes to biotech	Ma
25-May	**Hot news 1**: News and advances (student presentations)	Strauss
27-May	**Hot news 2**: News and advances (student presentations)	Strauss
30-May	Memorial Day Holiday, NO CLASS	Strauss
1-June	**Videos** – Student You Tube (student submissions)	Strauss
3-June	Labeling GMOs (REC) -- ***(final draft of essay due)***	Strauss

Class types and required pre-class submissions

The goal of these assignments is to encourage engagement and active learning.

LEC = Online Zoom lecture, please keep videos on as much as possible
REC = Recitations (discussion of assigned readings where students are called on to co-lead and actively contribute, video-on all class when in Zoom please)

For both types you must answer the questions given in Canvas prior to the class (8 AM deadline on the day of the class).

Lecturer requirements

Several guest lecturers are invited to take part to make sure students get senior and grad level information, which is difficult to do in this area given the complexity and fast pace of change of the underlying technologies and social responses to them. All lecturers will be asked to confirm to class goals and structure by 1) adhering to the active learning style by submission of materials online ahead of lecture so studens can view and analyze them, 2) are responsive to student questions that arise from pre-review of PPTs and materials during their lectures, and 3) in basic lecture content consider both the underlying science/technology and social context (e.g., regulations, governance, risk perception, ownership structure, intellectual property).

GRADING

Student grades will be determined according to the following breakdown: Final grades for undergraduates and graduate student grades will be assessed separately.

	UG	**Grad**
Attendance	10	10
Participation	5	5
Video - self intro	5	5
Discussion co-leadership	5	5
Essay		
Draft 10%, Final 10%	20	20
Pre-class write ups	20	20
Midterm	20	20
Hot news presentation	10	10
YouTube presentation	5	5
TOTAL	**100**	**100**

Letter grades will generally be assigned using this system: A+ = 98-100, A = 93-97, A-=90-92, B+ = 88-89, B=83-87, B-=80-82, C+=78-79, C=73-77, C-=70-72, D+=68-69, D = 63-67, D-= 60-62, F=59 or below.

Short summary of graded assignments (further details below in syllabus)

- Attendance active presence during at least ¾ of class period (Zoom video on)
- Participation (posing questions or comments during class time without being called on) will be rated by instructor using this spectrum: low (0), average (5), to high (10).
- Essays Two short essays on a topic of choice directly related to class content, OKed after consultation with instructor (format details below in syllabus)
- Midterm exam In class, short answer and essay
- You Tube video contribution (URL, its name/topic and your name), and both written (~50 words) and brief verbal explanation (in class) of the lesson it provides relevant to the class
- Pre-class write-ups Students will review readings and posted PPTs (PDFs) prior to class and upload answers to questions in Canvas by 8 AM before class.
- Hot news presentation Present on new research, policy, or news in biotech or toxicology in engaging manner (Technical content 7 pts, quality/clarity of presentation 3 pts)

ASSIGNMENT DETAILS AND GUIDELINES

Learning resources

All of the required learning resources will be from online sources accessible to OSU students. The are described in a separate PDF document with links that will be uploaded to the "Files" page in Canvas prior to the start of class.

Assignment deadline summary (exact timing in Canvas)

- 8 AM before all classes - Pre-class comments
- 30 March – Short self-description video (upload)
- 15 April – Deadline to email proposed essay topic/s to instructor
- By 29 April – View Food Evolution movie for discussion (may require payment)
- 20 May – Email proposed hot news topic to instructor (hot news presentation 25 and 27 May)
- 31 May – Upload URL for video to instructor (to be shown in class 1st of June)
- 6 June midnight, extra credit assignment/s deadline
- 6 June midnight, SLE completed for class x-credit

Pre-class submissions

Active learning approach: This classes emphasizes active learning where 1) students are called on during lectures to assess views and knowledge, and to stimulate discussion, and 2) students do readings and study the PPTS prior to class and answer questions in Canvas, as well as make inquiries, before class. Class lectures will then be guided toward student interests and points of confusion.

Pre-class questions will also be used as "quizzes" where students will be asked to briefly answer questions on the readings or PPTs similar to those as might appear on the midterm exam.

Grading rubric: The goal for all your written answers is to show you have done the reading/s and/or PPTs and attempted to understand them in sufficient depth that you can intelligently propose areas for further discussion during class meetings. Word length expectations are given in Canvas. You may also be asked to share them in class to stimulate discussion. All responses on Canvas will be graded as 0 (inadequate), 1

(adequate, 50%), or 2 (high quality, 100%). Bulleted answers are acceptable if meaning is clear. Example graded answers are given below.

Deadlines: Pre-class answers must be uploaded to Canvas by 8 AM the day of the class for credit. No late entries will be accepted. PPTs for review will often not be available until 24 hours before class. *We will not accept last minute computer/connection problems as excuses; be sure to leave yourself time to answer the questions by deadline*.

Example answers

Question: What is a key concept covered in reading X that you regard as important, and why?

For grade of 0
The reading for this class meeting covered GMOs.

For grade of 1
The reading by Jones et al. in Biotechnology Today was all about how you make GMOs and what it typically looks like. It showed that 1) tissue culture helps to identify the GMO cells, and 2) how hormones help to regenerate those cells into new plants.

For grade of 2
The reading by Jones et al. in Biotechnology Today was all about how you make GMOs and what it typically looks like. It showed that 1) tissue culture helps to identify the GMO cells, and 2) how hormones help to regenerate those cells into new plants. Interestingly, it also covered how *in vitro* culture is helpful in making GMOs 1) because the antibiotic selection step helps to identify the modified cells from the non-modified cells, and 2) it helps to make sure the modified plants are uniform as only single regenerating shoots can be taken (they are rare under antibiotic selection)

Self-intro video

The first short assignment is to help the instructor and other students to get to know you.

You will record a one to two minute video where you introduce yourself to the class. In your introduction, please include the following:

- Explain the reason *why you chose to take the class*, and any special life experiences or interests relevant to the class area

- Describe your *education, experience, and research background* in genetics, chemistry, or other course-related topics

You can record a video using the Embed Kaltura Media feature in Canvas. After starting a new discussion post:

> *From the text editor tool-bar, select Embed Media (film icon) > add new > webcam recorder > hit the red circle to record > then when you're happy, select save and embed to share the video as a discussion post.*

These videos will be available for instructors and students enrolled in this course.

Co-leadership of recitation discussions

Submit by email to instructor your first, second, the third preferences for leading a discussion by Wednesday midnight in week 1. You will then learn of your assigned discussion date and partner/s by noon the next day via Canvas announcement. For your assigned recitation, upload to Canvas a list of discussion questions no later than 8 AM the day of the scheduled recitation (containing at least 5 and no more than 10 discussion-stimulating questions that relate to the specific materials, in bulleted format). *You and your partner/s can submit the same or different lists, but must coordinate ahead to organize the discussions so they run smoothly, and do not cease until the period is over. Be sure to start the discussion with a brief statement of the goals/scope of the recitation, allow time for students to respond to other students (a queue may be needed), but also be ready to close things down and move on, going around the room to insure all students get a chance to talk.* The model for managing discussions will be illustrated during the first week, when the course instructor will lead the discussion. Students will be graded on the quality/depth of discussion questions they submit (2.5 pts) and quality of discussion stimulation/management (2.5 pts)

Student Learning Experience (SLE) survey and bonus point option

The online Student Learning Experience surveys id open to students the Wednesday of week 9 and close the Sunday before Finals Week. Students will receive notification, instructions, and the link through their ONID email. They may also log into the survey via MyOregonState or directly at https://beav.es/Student-Learning-Survey. *Survey results are extremely important and are used to help improve courses and the learning experience of future students.* Responses are anonymous (unless a student chooses to "sign" their comments, agreeing to relinquish anonymity of written comments) and are not available to instructors until after grades have been posted. The results of scaled questions and signed comments go to both the instructor and their unit head/supervisor. Anonymous (unsigned) comments go to the instructor only.

Bonus option: If 90% or more of students submit SLE evaluations by Friday night prior to finals week, all students will get a bonus of 2 additional class percentage points. If 90% is not reached, no bonus will be given to any students. This is to encourage the evaluations to be done, which are helpful to the instructor. The evaluation results cannot be viewed until after finals are completed, and are in any case anonymous.

Essay

Your essay, both the first and second draft, will be submitted in Turnitin online via Canvas (described below). *Both drafts should be submitted with correct final formatting; the first draft is not a "rough" draft but an attempt at a finished, well-written piece and will be graded with that expectation.* If there are few comments to the first draft you can submit a final draft without significant further revision if you wish (however, that is not expected for most cases 😉).

For the second draft, the goal is to improve on the first draft content, writing, and organization—a common practice when writing in science and life. In addition to a final clean document, please also submit a Word version that shows all changes made compared to the first draft you submitted with *revision marks*. The COMPARE option in Word (under "review" tab) is an easy way to produce this once the final draft is done.

Along with the second draft, also submit a document with up to two single-spaced pages of responses to the most significant comments/edits made on the first draft, explaining your changes to the essay (like additional or deleted lines or other major text changes, significant reorganization, added explanations etc), as well as what of the major suggestions you chose to ignore and why. Be sure to quote or summarize the comments you are responding to. There is no need to comment on minor changes such as for spelling. An example would be:

> Comment made on first draft: You might consider the consequences of exemptions to federal review and labeling of gene edited crops for international trade
>
> Response: I have added a few lines that discuss this issue, as quoted below:
>
> "A serious trade and legal liability problem may occur when gene edited crops, or adventitious presence of them, interact with legal systems like that in the EU where they are regulated like GMOs. This could also occur with the international codex registry system for GMO food. In both cases, documentation of safety and federal decisions on these varieties the systems need may be absent due to the exemption, resulting in rejection for trade or a lawsuit against the companies or governments involved (Jones et al. 2021)."

Deadline and late penalty

All essays submitted after the due date and time on Canvas will be graded but reduced in value by 20% per 24 hour period (or part thereof) that it is late.

Essay scope and structure

Choose any topic of interest to you related to class content, and submit the tentative title and a short description (1-2 lines) of the essay topic to the instructor Strauss by email for approval prior to submission. The essay must be clearly and directly related to the course themes, have not been used for any other courses, *provide a critical perspective using evidence as support, and demonstrate a multidisciplinary approach*. For example, a simple description of a technological advance, without regard to multiple disciplinary perspectives, will not suffice for this essay. However, description of a technology along with evidence related to its societal impact and acceptance would be well aligned with goals for this assignment.

Note that biomedical genetic technology per se is not suitable, unless it also involves agriculture, environment, or the production of pharmaceuticals in plants or animals. Thus, gene drive mosquitoes to stop human viruses, which raise environmental (and societal) issues, would be acceptable but CRISPR to alleviate sickle-cell anemia would not be acceptable. The essay should not be too generic (e.g., "GMOs and agriculture," or "Pesticides and our World," are not good topics; better topics would be "Herbicide tolerant crops and biodiversity" or "Making Covid vaccines in tobacco plants"). There is no need for a long introduction about what GMO crops or chemicals are; get right to your topic after a short introduction (one paragraph max). *Do not include an abstract.*

Be sure to first read and refer to *review papers or other summary documents* as its often hard to get on top of a complex issue without some general reading first. Be sure not to "cherry-pick" the literature, citing only what supports your personal viewpoint, and try to use credible sourcs (scientific journals, credible news outlets, credible organizations—and do not cite class readings or lecture materials). Given a broad view before you focus in.

For each essay provide:

1. A summary of the general and technical aspects of the area (about half of the essay)
2. Your own insights/critiques and justification thereof (*not simply your personal opinion*). This should be about half of the essay.
3. Essays will be graded based on technical content (70%) and quality/clarity of writing/organization/grammar (30%) as given in the grading rubric below:

    Technical content: Currency of information (20%), depth of information/compliance with length requirement (20%), connection of science to application (10%), social/regulatory context for the application (20%). Both application and social context are expected to include a critical assessment of claims and goals.

    Clarity: Organization of content/subheads (10%), quality of written expression (10%), grammar/spelling/formatting (10%)

Format details

a) *Use content-related subheadings* (e.g., "Need for new varieties;" or "Hormone genes given unexpected results" etc) extensively to help organize and communicate the logical flow of the essay.
b) At least 8 (but no more than 12) references that you cite in the text. None should be an assigned class reading or video. List in alphabetical order at end of paper.
c) A minimum of 6, with a maximum of 9, complete double-spaced pages with 12-pt font and 1-inch margins (excluding references and any figures and tables). *The portion of the essay that provides a critical, multidisciplinary assessment must be above 1,250 words, excluding references and figures/tables.*
d) *Do not shrink margins or fonts, or insert extra lines/spaces in text, or you will be penalized for not reaching minimum length. There should be no blank lines between paragraphs or sections.*
e) If any figures or tables are used, they must be readable and have a title and legend with them. They must also be cited in the text where their meaning relevant to your paper narrative is clear Place them after the text but before the references as they will not count toward the required minimum length.
f) Use quotations of literature sparingly, only for emphasis. No more than 10% of your text, excluding references, should be quotations.
g) Cite your references in the text (do not simply use a number) and give full literature references for all sources cited in a consistent, scholarly format with author, year, title, source, web site URL as hot link (not spelled out). For example:
   Strauss, S.H., Kershen, D.L., Bouton, J.H., Redick, T.P., Tan, H., and R.A. Sedjo. 2010. Far-reaching deleterious impacts of regulations on research and environmental studies of recombinant DNA-modified perennial biofuel crops in the United States. *BioScience* 60:729-741.
h) Citations in the text should have this form: Lastname (or Institution like EPA) Year. Examples: (Axton 2007, Axton and Strauss 2009, Axton et al. 1955, EPA 2004).
i) Do not put URLs in the text--put them at the back with references as hot links. Do not list page numbers or first names or initials of authors when making citations in the text
j) Include page numbers on all pages, at the bottom or top right.

Lateness: See the lecture Canvas for essay due dates and times. Please alert the instructor ahead of time via email if you will submit late. Provide documentation (such as a doctor note), ahead of deadline where

possible, if you think you have a legitimate excuse for circumstances beyond your control, and we will consider extending the deadline for you without penalty.

Turnitin Plagiarism Detection

This course uses Turnitin, an online grading and plagiarism detection system enabled within Canvas, that will check for matches between submitted work and internet sources as well as comparing submitted works for significant matches. Turnitin returns reports assessing the percentage of text matching and allows the instructor to view suspected matches in order to judge the likelihood of plagiarism. A guide on how to cite and paraphrase correctly can be accessed here.

Essays with plagiarism will either have their value reduced by up to 25% if only moderate instances are noted. Essays with multiple instances of plagiarism will not be graded but will be returned to students who will have one week to revise and resubmit the essay for credit; the maximum essay value will be reduced by 50%. Instances of repeated plagiarism will be referred to the OSU Office of Student Conduct and may result in failure of the class or more serious actions by OSU.

Hot news presentation

Choose a topic that was covered in one or more news articles and *present to the class in a TED-like, story telling format where possible*. In this format, you create a narrative about the news, usually including a buildup/problem/context, what was done/seen that mattered, and ending with a resolution/impact/what happens next. Make sure it is *directly related to class content*, based on information that was mostly published during 2019-2022, and you *critically assess* as well as summarize it. It should not focus on an assigned reading for class. Plan to present it verbally in a minimum of 3 and a maximum of 4 minutes (times may vary depending on class size, and will be finalized each quarter). Somewhere in the presentation give 1) the dates, headlines and sources, 2) summarize its content and alleged importance, then 3) critique it, including the social context affecting it (e.g., regulations, public concerns, patents). The use of a short PPT (max of 15 slides) or comparable presentation technology is required. Email the topic planned ahead to ensure you are not duplicating that of another student (see class schedule). Upload your PPT to Canvas by 8 AM on the day when we start presentations; a 10% late penalty will be added for each 24 hour period or portion thereof, up to the final time of presentation (after which no credit can be obtained). It will be graded based on structure/clarity (30%) and content (70%).

YouTube video

For YouTube "videos" days during recitation, please identify **two** short video clips available on the web; the first should be your first choice and the second an alternative in case someone else shows the first one before you. They can either pro-biotech or anti-biotech (or pro- or anti-chemical), or have class-relevant science or insights of any kind. Choose ones that are good, perhaps funny, but informative and related to class themes. Upload the URLs and your text descriptions (at top state the subject and length, times in video to watch) and then say why you think each is worth seeing.

Upload under assignments in Canvas by 8 AM on the day they will be shown; credit will be reduced by 10% per 24 hour period or portion thereof for late submissions. Choose one that you can show most of (or a part of) in 2-3 minutes (time limits may vary depending on class size, and will be finalized later). If its not in English, be

sure it has English subtitles. It's fine to team up with two or three other students if desirable, and your time will be increased proportionally. After showing it, you will be asked to explain why you chose it and its value, lesson, or key shortcoming. All students will then engage in brief discussion about it.

Students will be graded on quality of the You Tube and your explanation for class learning from zero to 10 using this rubric: 0 = inadequate (unclear merit, value), 5 = adequate (informative), 10 = excellent (insightful/funny/creative).

Extra credit

You can submit one extra credit assignment. It is worth up to 2% on top of the course grade. Please find the options below. You may also provide other options if you contact the instructor and get permission. See t*he deadline is in Canvas.*

Option 1: Survey Report

Please survey three friends or family members who you think might have a view, positive or negative, about GMO crops and food. Do not include their names; let them know this informal survey is a class exercise and their identity will not be revealed.

For each person ask this exactly and summarize each person's answers to each question:

1) Can you define what a GMO or genetically engineered crop or food is, as best you can be based on what you know or have heard?
2) Do you view GMO crops and food mostly positively, negatively, or close to neutral? Why?
3) What one or two facts or stories have you heard most prominently about a negative and a positive aspect of GMO crops or food?

After you are done recording the responses, inform those you have interviewed about your knowledge of the correct science (definition, positive and negative aspects), and record the response and reconciliation or disagreement that resulted.

In your report, summarize all of the responses for each question and person you interview, and what you think these responses mean in total (paying attention to who/what caused them). The report should be two to three double-spaced pages.

Option 2: Artistic exercise

Choose an artistic product to earn extra credit! This option is designed to allow you to express your understanding and feelings (*e.g.*, frustrations, anger, pain, *etc.*) on GMO labeling and/or toxicology through art. You may choose any genre of art you like. For example, you can write a poem or short story (*at least two double-spaced pages*), a complex image or series of images, or a song. If you choose to write a poem/short story or sing a song, you should read/sing it in a video (at least 1 and no more than 3 minutes). For the artwork, please also include an explanation in written or spoken words that also shows you understand the science concepts behind your subject (up to an additional minute). Here is an example (Sound of Skeptics) that hopefully inspires you.

Your artistic product will be graded based on the criteria below (rubric is 1/2 point each):

- Did the work express a clear message and point-of-view?
- Did the work demonstrate your understanding of the science clearly?
- Was the work engaging? (Would people actually want to stop and pay attention to it?)
- Was the work informative? (Would people with little to no knowledge of the topic have learned something?)

Option 3: Social Media Exercises (choose either A or B)

A: **Assess a Claim on Instagram/Facebook**

1. Find a social media post with a claim about GMOs (technology, human health impacts, environmental impacts, benefits). There are many pages dedicated to GMO advocacy that could provide source material, including: @NonGMOProject, @GMOFreeUSA, @GMWatch, @GMOAnswers. Searching GMO-related hashtags is also a great way to find these types of posts (e.g. #gmo, #monsanto, #nongmo, #gmolabeling). Include a screenshot of the post you will be assessing in your write up (example I Figure 1).
2. Investigate the credibility of the claim by reading any reports cited within the post, finding other sources that discuss the post topic to determine if it the information is valid and credible.
3. Other options for investigation:
    a. Investigate where the post came from. Who is the organization the posted it originally? Is it original content or has it been shared many times?
    b. Learn more about that organization and hypothesize why they would want to post this type of information. Do they have inherent interests in spreading this type of information? For example, are they an advocacy organization focused on a specific goal related to GMOs? Are a majority of their posts related to this topic?
    c. What does response to the post look like? Does the post have a significant reach (multiple shares, likes, comments)? Are the comments substantial? Do commenters agree/disagree with the post? Does the original poster interact with dissenting commenters?

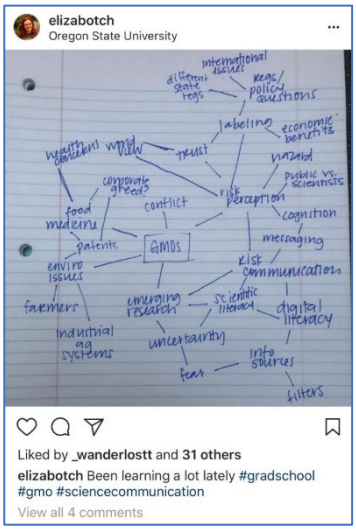
Figure 1: Example of a GMO-related post on Instagram that could serve for Option 1 extra credit. A screenshot of this type would be required for submittal with the assessment

B: **Share credible GMO-related information on your own social media pages**

1. Use your own social media page to spread credible GMO messages. There is a lot of creativity available in how you implement this project. For example, you could share multiple examples of GMO labels and their relevancy (e.g. non-GMO labels on oranges that have never been genetically modified). You could

also share insightful articles related to GMOs with your network. You could host a poll on your Instagram or facebook page about GMO support. Show at least one screenshot of your page and posting/s (e.g., Figure 2).

2. Requirement: post at least 4 posts on your social media around this theme. Include screenshots of those posts in a write-up and discuss your experience with this project.
    a. Questions for consideration include:
        i. How did your followers respond to this information, if at all?
        ii. Did it spark any in-person conversations?
        iii. How did you choose what you wanted to share? Why did you choose this type of information?
        iv. What actions can we take individually and collectively to help ensure only credible information is shared online?



COURSE POLICIES AND EXPECTATIONS

Class make-ups

Students will be excused from missing **one** class or recitation, whether for illness, family, or any other reasons if explained in an email to the instructor. Excused absences beyond this will need to be discussed with an instructor and must involve unusual circumstances and documented. Examples might be notes from a doctor or clinic, an obituary for a funeral of a family member, or a signed letter from another OSU student (including full name, emails, ID number) who witnessed the event (e.g., injury, illness, death of friend). If the documentation is convincing, a decision will then be made about a new deadline or other plans for make-up of full or partial credit. The documentation can come up to ten days after you make first contact with the instructor about the emergency. In addition to documentation about the absence, a **second or third** excused absence can be made up by submission of a 1 page, single-spaced, 12-pt font, well written, and originally drafted (no cut and paste!) summary of the lecture PPT and readings (recitation) for that meeting that shows you have viewed and understood <u>all</u> of it (in addition to the pre-reading submission for all class meetings required on Canvas). Like for extra credit, they must be submitted by email by the first day of finals week, identifying what lecture/recitation you missed and wish attendance excused for.

Recitations

For the discussions on Fridays, we expect students to read the material beforehand, provide responses online ahead of class as with the other meetings, and to actively participate in the discussion. The intent of the recitations is to provoke thoughtful responses and elicit your perspective on complex or controversial issues. Come prepared to say something as we will ask each student to make a comment or pose a question.

Class behavior recommendations

Canvas/syllabus conflicts: If you find a conflict between what is written on the class documents and Canvas, please use what is on Canvas as that is updated after the start of class (whereas the documents may not be).
*Online teaching amidst Covid-19 pandemic: This class is slated for in person learning, however, pandemic conditions may change class format on the fly. If you need help coping with pandemic related issues please reach out to me or CAPS (*541-737-2131*) and connect with your classmates via Canvas.*
Zoom etiquette: Because this is a senior/grad level class that deals in complex science-society topics, there is frequent discussion and interactions. If we end up holding some or all classes in Zoom, I hope you will keep your camera on most of the time (use an artificial background if concerned about sharing your home environment). For our recitations most Fridays, it is a discussion format which benefits greatly from being able to see one another with our gestures and smiles, as well as to hear words, during the entire class period.

Student Bill of Rights

OSU has twelve established student rights that this class will adhere to. They include due process in all university disciplinary processes, an equal opportunity to learn, and grading in accordance with the course syllabus: https://asosu.oregonstate.edu/advocacy/rights

Plagiarism

As defined in the Oregon State University Student Conduct Code, Plagiarism is: "Representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing (including use of quotation marks), presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own."

For more information about plagiarism and how to avoid it, please refer http://www.plagiarism.org/. You are responsible for the content at this web site.

Consistent with the OSU Student Conduct Code, the primary purpose for using a plagiarism detection system is to "maintain and protect an environment conducive to learning, in keeping with the educational objectives of Oregon State University." These educational objectives include proficient and individual effort in academic writing. https://studentlife.oregonstate.edu/studentconduct

You may reduce the likelihood of plagiarism in your work in three ways:

1. Use proper style, quotations, and references.
2. Use the online Plagiarism Resource Site (see your online course site).
3. Consult with the OSU Writing Center (http://writingcenter.oregonstate.edu)

Submitted work in all classes at OSU that use it will be retained as comparison documents in the Turnitin reference database. Works in that database will be retained as source documents in future terms. Works in the Turnitin reference database will be used solely for the purpose of detecting plagiarism.

Students with disabilities

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at http://ds.oregonstate.edu. DAS notifies students and faculty

members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations—a policy with which this class will comply.

Family/health emergency

University students encounter setbacks from time to time. If you encounter difficulties and need assistance, it's important to reach out. Consider discussing the situation with an instructor or academic advisor. Learn about resources that assist with wellness and academic success at oregonstate.edu/ReachOut. If you are in immediate crisis, please contact the Crisis Text Line by texting OREGON to 741-741 or call the National Suicide Prevention Lifeline at 1-800-273-TALK (8255).

Expectations for student conduct

Student conduct is governed by the university's policies, as explained in the Office of Student Conduct and Community Standards and here. While in class, every student is expected to show respect for diverse backgrounds, political affiliations, ethnicities, gender identifies, and sexual orientations. They are also expected to show respect for diverse views about the roles for biotechnology and chemicals in food and environment, which are explored in depth in this class.

Adherence to academic calendar

All students are subject to the registration and refund deadlines as stated in the Academic Calendar: https://registrar.oregonstate.edu/osu-academic-calendar

Academic integrity

Students are expected to comply with all regulations pertaining to academic honesty. For further information, visit Academic Misconduct, or contact the office of Student Conduct and Mediation at 541-737-3656.

OAR 576-015-0020 (2) Academic or Scholarly Dishonesty:

a) Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the Student's own efforts or the efforts of another.

b) It includes:

> (i) CHEATING - use or attempted use of unauthorized materials, information or study aids, or an act of deceit by which a Student attempts to misrepresent mastery of academic effort or information. This includes but is not limited to unauthorized copying or collaboration on a test or assignment, using prohibited materials and texts, any misuse of an electronic device, or using any deceptive means to gain academic credit.

(ii) FABRICATION - falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.

(iii) ASSISTING - helping another commit an act of academic dishonesty. This includes but is not limited to paying or bribing someone to acquire a test or assignment, changing someone's grades or academic records, taking a test/doing an assignment for someone else by any means, including misuse of an electronic device. It is a violation of Oregon state law to create and offer to sell part or all of an educational assignment to another person (ORS 165.114).

(iv) TAMPERING - altering or interfering with evaluation instruments or documents.

(v) PLAGIARISM - representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.

c) Academic Dishonesty cases are handled initially by the academic units, following the process outlined in the University's Academic Dishonesty Report Form, and will also be referred to SCCS for action under these rules.

Tutoring

NetTutor is a leading provider of online tutoring and learner support services fully staffed by experienced, trained and monitored tutors. Students connect to live tutors from any computer that has Internet access. NetTutor provides a virtual whiteboard that allows tutors and students to work on problems in a real time environment. They also have an online writing lab where tutors critique and return essays within 24 to 48 hours. Access NetTutor from within your Canvas class by clicking on the NetTutor button in your course menu.

Useful Links

Oregon State University Online Writing Lab Service: https://experience.oregonstate.edu/resources/online-writing-lab
Canvas Student Guide: http://guides.instructure.com/m/4212
Technical Help: http://ecampus.oregonstate.edu/services/technical-help.htm
Off-campus access of OSU resources: http://oregonstate.edu/helpdocs/protected/network/vpn-campus-access.

COURSE MAP AND STUDENT LEARNING OUTCOMES

In addition to the summary provided in the map below, the main learning outcomes for the class are assembled below.

At the end of the class, students should be able to describe and critically analyze:

- Relationships among science, technology, and society with relation to GMO crops and pesticides using critical perspectives or examples from historical, political, or economic disciplines
- The role of science and technology in shaping breeding, and gene and chemical regulation, over time.
- How organisms have been domesticated, cultivated, and genetically manipulated via conventional breeding, and how biotechnology is similar and different
- The basic methods used to isolate and manipulate genes, and transfer them into plants, animals, and microbes
- The kinds of GE organisms in commercial use, and on the horizon for use in the near to mid-term, including insect-resistant corn, herbicide-resistant crops, medicine-producing livestock, and growth-enhanced fish
- How genetic engineering has modified agricultural practices with respect to pesticide use, soil conservation, water quality, and other environmental measures
- How environmental and health impacts of chemical use are studied and analyzed
- How chemical uses have led to unintended consequences, and how these lessons have informed subsequent laws and regulations
- How the toxicity of synthetic and natural chemicals compares and is regulated by governments
- How GE organisms are tested for food and environmental safety, the government regulatory bodies involved, and their requirement
- How ethical values and perspectives affect social and personal acceptance of GM crops and chemicals
- How the interests and values of populations in the poor and developing world differ from those in the developed world with respect to GM crops
- The reasons for ideological as well as legal and ecological concerns by organic farmers and some activist groups about GM crops
- Ability to critically analyze claims made by companies, scientists, and government agencies about food and environmental safety of new agricultural technologies

Graduate student work and learning outcomes

Grad students will be required to do additional readings and take part in separate class discussions, with the topics to be decided during the term depending on student interests. Common topics have been ethics and animal biotechnologies as they are not well covered by class lectures or readings.

Graduate students will be graded at a higher standard than undergraduates. In addition to the BAC core learning outcomes described above that apply to all students, graduate students will:

- Understand the relevant biology, food safety, legal, and environmental issues with suitable depth and capacity to integrate among the various issues.
- Be able to propose solutions, in the form of biological innovations and regulatory modifications, that might help to resolve important pesticide and GMO crop issues.
- Critically evaluate the biases inherent to information from various sources, including to identify the ideologies and information frames adopted by various interest groups and citizens.

Course map

Week	Learning Objectives	Course Activities	Assessment and Measurement graded assignment
Week 1	Upon completion, students will be able to: • Describe basic ideological differences that underlie the GMO controversy • Under biotech science basics • Understand pre-biotech history of crop breeding	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	• Video self-intro due and graded • Students will answer questions on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.
Week 2	Upon completion, students will be able to: • Describe the physiology of plant gene transfer and regeneration • Describe how genes can be specifically suppressed or mutated • Put newer and older methods in historical and technical context	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	Students will answer questions on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.
Week 3	Upon completion, students will be able to: • Describe the problem and century of breeding technologies applied to solve chestnut blight	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	Students will answer questions on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.

	• Describe the diverse mechanisms of gene flow and how they affect GMO crop admixture • Describe how gene flow between grasses, and ideological differences, impacted farmers in Oregon		
Week 4	Upon completion, students will be able to: • Describe how pesticide safety is evaluated in scientific studies and by regulatory agencies • Describe the history and causes of the recent controversy over the Roundup herbicide • Describe how risk perception is controlled and its relation to food biotechnologies	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	Students will answer questions on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.
Week 5	Upon completion, students will be able to: • Describe stressors affecting the success of wild and commercial pollinators and its relation to biotech and pesticide use • Describe how GMO crops are reglated by the federal government in the USA • Analyze the video and arguments made in the movie “Food Evolution” for their merit and bias	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	• Essay draft 1 submitted and graded. • Students will answer questions on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.

Week 6	Upon completion, students will be able to: • Describe how various methods are used by breeders and agronomists to improve nutritional qualities of crops and derived foods • Describe how intellectual property in the form of new genes and varieties are protected in the USA • Analyze the record and arguments of a famous anti-GMO activist for their merits and shortcomings	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	Students will answer questions on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.
Week 7	Upon completion, students will be able to: • Describe the structure of organic certification, with a focus on GMOs and pesticides, and the scientific record about its merits and limitations • Analyze arguments for both pro- and anti-GMO activisms' links to colonialist worldviews and campaigns	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	• Midterm given and graded. • Students will answer questions on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.
Week 8	Upon completion, students will be able to: • Describe new laws and technology to maintain food safety in the USA • Describe the regulations, and the benefits and concerns, of laws that govern dietary supplements in the USA	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	Students will answer questions on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.

	• Analyze the sources of uncertainty and bias when policy makers consider scientific evidence and opinions of scientists		
Week 9	Upon completion, students will be able to: • Describe the methods used for assessing public attitudes toward biotechnologies • Describe the prevalent attitudes of Americans toward GMO crops, trees, and foods • Describe new and contemporary events in technology or social activities with respect to food biotechnology and pesticides	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	• Student given "hot news" presentations in class, and are graded. • Students will answer questions on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.
Week 10	Upon completion, students will be able to: • Describe the pros and cons of various labeling laws with respect to GMO foods • Describe in detail the provisions of the recent GMO labeling law put in place in the USA • Describe examples of how video is used to sway the public by pro- and	Readings, two lectures and Friday discussion (recitation). Students answer questions on readings and lecture PPT prior to class to get them ready for class materials.	• Final draft of essay submitted and graded. • Students submit and explain You Tube videos in class and are graded. • Students will answer questions

	anti-biotechnology and pesticide interests		on readings and lecture PPTs in Canvas prior to class and be graded on quality of answers.

BACC CORE SUMMARY

Learning outcomes

This class qualifies for the Bacc Core in the Synthesis category of Science, Technology, and Society. The student learning outcomes for courses in this area are for students to be able to:

1. Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.
2. Analyze the role of science and technology in shaping diverse fields of study over time.
3. Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.

Summary evaluation of learning outcomes with respect to class content

A matrix summary of the relation of class structure and activities to the BacCorr learning outcomes is provided below, with a longer version available here. In summary:

Bac Core Criterion 1: Many lectures and readings in class explicitly include historical, political, or economic perspectives and information. Students will be evaluated for their understanding of this information by their participation in relevant class discussions, and by evaluations of exams, essays, and presentations. For example, students will be expected to understand regulation of GMO crops and pesticides in relation to historical practices in plant breeding, patents, and chemical development, and the economic and political forces and consequences pertaining to these developments.

Bac Core Criterion 2: Many lectures and readings in class explicitly include consideration of how related fields of study have been affected by genetic and chemical technology. Examples include how recombinant DNA methods gave rise to the discipline and business of genetic engineering, how advances in basic chemistry have given rise to pest management/fertilizer businesses and fields of study, and how concerns about these technologies have helped to spur the growth of organic food certification systems.

Bac Core Criterion 3: All students must write essays on gene/chemical topics related to course content that include evidence related to the topic and a critical analysis of the core issues pertaining to the technology and/or social acceptance. It is an essay requirement that they cite literature

and facts as evidence for positions they take. The essay must provide a critical perspective using evidence as support, and demonstrate a multidisciplinary approach. The critical analysis part of the essay must be above 1,250 words, excluding references. At least 8 (but no more than 12) references must be cited in the text.

Matrix Bacc Core summary

Outcome	How this outcome will be addressed in the course	How this outcome will be assessed in the course
Analyze relationships among science, technology, and society using critical perspectives or examples from historical, political, or economic disciplines.	This course is fundamentally about how science and technology (biotechnologies of various kinds, and chemistry in production of pesticides) have evolved over time, and social views and institutions related to them have responded. A historical context is established in the second and subsequent lectures by asking students to first understand how earlier "biotechnologies" for crop improvements, starting with those from the pre-scientific era, were similar and different to modern biotechnologies in technical capacity, human perception, and associated legal systems. The course is filled with examples of various biotechnologies and pesticides, considering both their technical basis and record, and how society has responded with lawsuits, activism, corporate consolidation, etc. Examples include, among many others, pesticide impacts to pollinators, and the environmental and economic impacts of herbicide tolerant crops.	Many lectures and readings in class explicitly include historical, political, or economic perspectives and information. Students will be evaluated for their understanding of this information by their participation in relevant class discussions, and by evaluations of exams, essays, and presentations. For example, students will be expected to understand regulation of GMO crops and pesticides in relation to historical practices in plant breeding, patents, and chemical development, and the economic and political forces and consequences pertaining to these developments. This will be assessed during grading of student pre-class comments in Canvas, weekly literature discussions that probe key incidents in the field from several perspectives (e.g.,. farming and activist responses to the unintended spread of a GMO grass crop in Oregon), a long critical essay on a topic of choice, and a mid-term exam with integrative questions that probe relationships among technology and society (e.g.., a common type of question on exams has been "Are herbicide resistant crops sustainable? What does this mean, and how might various social actors and institutions respond differently to the question)."

	Students are encouraged to evaluate various technologies and information campaigns critically in their essay, presentations, and daily comments on reading materials and PPTS prior to lecture.	
Analyze the role of science and technology in shaping diverse fields of study over time.	A historical, multidisciplinary approach is inherent in course structure. This was discussed under learning outcome #1. The course starts with an examination of how society's and markets have responded to genetic engineering (GE) used on crops and food, and how it has prompted extensive studies of social perceptions and regulations—thus affects diverse fields of study. In the second class meeting, and others (e.g., evolution of pesticide use, food safety technology and practices) students get a historical perspective on how various biotechnologies have evolved over time and affected other fields, such as communication methods and regulatory science for both the pesticide use and food safety technology examples.	Many lectures and readings in class explicitly include consideration of how related fields of study have been affected by genetic and chemical technology. Examples include how recombinant DNA methods gave rise to the discipline and business of genetic engineering, how advances in basic chemistry have given rise to pest management/fertilizer businesses and fields of study, and how concerns about these technologies have helped to spur the growth of organic food certification systems. This will be assessed during grading of student pre-class comments in Canvas where historical trends are often probed (e.g., answering "how are the new methods of gene editing and conventional breeding as practiced for centuries similar and different"), weekly literature discussions that probe historical trends in the field from several perspectives (e.g.,. "how is perception of risk from ag technology different in today's largely urban population vs. that of a largely rural population of a century ago"), a long critical essay on a topic of choice, and a mid-term exam that often examines changes over time (e.g., with questions like: "how does scientific perception of risk today differ from that at the outset of the recombinant DNA era when so little was known about genomes, and have regulatory institutions changed along with the science in your view?").

Articulate in writing a critical perspective on issues involving science, technology, and society using evidence as support.	The class has two mechanisms for writing critical perspectives. The primary one is a required long essay, with the subject of the students' choosing, that is directly related to class themes and for which required content includes both a description of the problem or technology and its critical assessment. The second mechanism through which this learning outcome is assessed is through essay type questions on the midterm. These are generally integrative and require critical assessment of an idea or assertion.	All students must write, and are graded on, essays on gene/chemical topics related to course content that include evidence related to the topic and a critical analysis of the core issues pertaining to the technology and/or social acceptance. It is an essay requirement that they cite literature and facts as evidence for positions they take. The essay must provide a critical perspective using evidence as support, and demonstrate a multidisciplinary approach. The part of the essay that included critical analysis must be above 1,250 words excluding required references. The total length is at least 6 double-spaced pages, 12 pt font, 1 inch margins.