Course Objective and Learning Outcomes:

Course Objective

The objective of this course is to provide students with the scientific background information they need to make informed decisions regarding the necessity and ethics of biotechnological advances.

Learning Outcomes

By the end of this course you'll be able to:

- apply basic chemical and biological concepts to improve your understanding of more complex biological issues;
- describe examples of how biotechnology can help us provide for the growing human population by improving the productivity of plants and animals, preventing and treating existing and emerging human diseases, and making industrial processes and agriculture more sustainable;
- analyze the advantages and disadvantages of various biotechnology approaches using an objective approach;
- communicate an opinion on the ethical, social, or financial aspects of biotechnological approaches to solve challenges facing the world;
- read and understand scientific literature from popular sources such as magazines and newspapers and prepare a written summary of a scientific topic;
- improve your written communication skills through an iterative process of planning and editing, based on external and self review.

Due: Wednesday, January 13th

- Syllabus Quiz (see note about late penalties for the first week, below)

Due: Thursday, January 14th

- Discussion 1: Introduce yourself (see note about late penalties for the first week, below)

I will not apply late penalties for the first week of the course. After that, students who register for the course late or contact me to provide an excuse will be given extra time to complete these two items without penalty.

Course Description and Instructor Contact Information

This document introduces you to your instructor and TA. It also includes information about instructor office hours. [See also the Office Hours tab below the Syllabus tab in Content.]

Required Course Materials

This document lists required texts (none), hardware, and software for this course.

Course Activities and Graded Assignments

This document has a break down of all the points available in this course as well as important information about the nature of the different graded items. As such, it is one of the most important documents to read thoroughly in this Syllabus section.

Policies
Here is a printable calendar showing the due dates for this course.

After downloading this file, you can add your own notes or schedule time to work on this course in this calendar. You can even add in the due dates for your other classes! It was made in Excel but might work in Sheets, though I haven't tested it.

This document has my 'best practice' tips for studying for this course.

This document has tips on getting help with studying in general - whether for this course or another course you are taking.

After reading the documents in the Syllabus and Course Organization section, take this quiz to show your understanding of the course logistics. You have two chances to take this quiz, so if you don't get it all right the first time, try again!

There are two parts to this assignment and you need to complete both parts to earn full credit.

PART 1: Please write a paragraph to introduce yourself to your instructor and your classmates in your group. Click "Start a new thread" to create a new post, in which you answer the following questions:

- What name should we call you and what pronouns should we use for you? [If you are uncomfortable providing your pronouns, you may skip this.]
- What is your current major and what career do you hope to have?
- What is a talent or hobby you have or what is an interesting fact about you?
- Click on the camera icon in your post to insert an image* of one of the following and write a sentence to explain why you chose to share the place/person/pet in your image:
  - Favorite place or a place you want to see one day
  - Person you admire
  - A pet

PART 2: Respond to a classmate's post in such a way that makes it clear you read their post carefully and then add something meaningful/relevant to the conversation.

*Here are further instructions on how to insert media (item 2 shows how to insert photos): https://help.d2l.arizona.edu/content/students-insert-media-your-discussion-threads

If you are new to D2L Discussions, you may find more information here: https://help.d2l.arizona.edu/content/students-discussions
Tips for college: Sleep, An Underappreciated Key to College Success

Please see highlighted sections, and especially the tips at the end.

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Tips for college: UA's Think Tank

UA's Think Tank offers various services to support students academically, including:

- Tutoring
- Writing center
- Academic skills tutoring
- Supplemental instruction
- Math exam prep

For more information, go to the Think Tank website.
Modern biotechnology has answers to the questions: How can we better provide for the growing human population by improving the productivity of plants and animals? How can we prevent and treat existing and emerging human diseases? How can we make industrial processes and agriculture more sustainable? But the use of biotechnology is controversial when it involves genetic modification of organisms. In this class, you will be presented with many examples of biotechnological advances and be given the background to understand them so that you can decide if the reward is worth the risk. Subjects covered may include developing new vaccines, making faster-growing salmon, cloning pet dogs, producing biofuels to replace fossil fuels, manufacturing pharmaceuticals in the milk of various animals or in plants, and discovering cures or preventative for human ailments.

Course Format
The course is broken into 8 modules, each centered around a different topic.

In most modules, you will increase your understanding of the natural sciences by participating in pre-recorded presentations (10-15 minute lectures with quizzes embedded via the Playposit tool), watching videos, reading selected articles, completing online activities, taking stand-alone Quizzes in D2L, and discussing topics in writing with your classmates. After every two modules, you will complete an open-book exam to assess your learning. Over the course, you will also complete three parts of a major writing assignment, to improve your fact-based writing skills.

To be successful in this course, you will need to be active in your learning and strive for understanding rather than just memorization when completing the activities and assignments. If you take a more passive approach to the class or you do not complete the required activities/assignments, you will be less likely to be successful in this course.

Additionally, you will need to manage your time to pace your learning and complete all the course material and graded items by the due dates. This ready-to-print or editable calendar with the due dates might help you keep track of the due dates, or you can regularly check the Calendar on the right side of the course homepage to see the upcoming due dates. I suggest that if you don't want to use one of the calendars I've provided, you take the time now to enter the due dates in your digital planner/calendar (or look for an Announcement after the course starts about how to synchronize your calendars) and be sure to check into D2L regularly to look for upcoming deadlines!

Instructor Contact Information

Professor
Samantha Orchard, Ph.D. [please call me "Dr. Orchard"; I use she/her/hers pronouns]

Email Address
orchard@arizona.edu

Email Response Time
Emails will be answered within 24 hours on weekdays and likely sooner.

Phone Number
(520) 621-3969 [email preferred]

Office Location
[Currently working from home]

Office Hours (time to meet with instructor one-on-one)

Due to the COVID-19 pandemic, I will only be holding virtual office hours this semester.

- Open-office hours: These are times I set aside to meet with students in my courses without students needing to schedule an appointment with me. I will be available at Mondays from 2:15 to 3:30 pm for open-office hours (this link will connect you to me via Zoom). I have enabled a ‘waiting room’ for this recurring Zoom meeting. That means you will have to wait after you connect and until I let you into the meeting. It also means that you should join with your actual name so that I can recognize you and let you in! The waiting room allows me to ensure privacy for each student I am meeting with and I apologize if you have to wait to meet with me. Because Zoom times me out if I am idle for a while (no students showing up), I might not always be in the Zoom meeting when you arrive - within a few minutes, I will get an email notification that you are in the meeting and I will then join. So, please just stay put! Or, send me a quick email, too.
- Private appointments: If the open-office days/times don't work for you or you need to meet with me sooner, contact me by email at orchard@arizona.edu to make an appointment for another day or time. Do not be shy about asking to meet because this is part of my job, paid for by your tuition dollars, and I enjoy speaking with my students!

Note!
You will be notified, in advance, of any scheduling issues that may impact my response times.

Instructor Biography

Samantha Orchard is an Associate Professor of Practice at the University of Arizona, where she teaches courses about Biotechnology, and is friendlier than she may look in this photo. She got a B.S. in Microbiology from the University of Washington (Seattle), a Ph.D. in Bacteriology from the University of Wisconsin (Madison), and post-doctoral experience in bacterial genetics from San Diego State University (California). After her postdoctoral training, she transitioned to working in the biotechnology industry, first at a small biofuels start-up type company and then at a larger company that makes and sells enzymes for industrial applications. After more than 8 years in industry, she returned to academia in 2018 to bring her real-world biotechnology experience to the classroom. In her time in industry, she enjoyed working with people with varied backgrounds and in different positions (e.g. Legal, Business, Regulatory, Safety, Manufacturing, Quality Control and Quality Assurance, etc.) and she encourages people without scientific training to consider careers in the Biotechnology industry.
Additional instructor information

Teaching Assistant (TA)
Marta Kozłowska (you may call her "Marta" or Ms. Kozłowska; Marta uses she/her/hers pronouns)

Email Address
mkozloowska@arizona.edu

TA biography
Marta is a second year PhD student in the School of Plant Sciences and got her BSc in Biochemistry from the University of Edinburgh, in Scotland. Marta is now doing research in Dr. Jesse Woodson’s lab, where she focuses on developing ways to track the precise molecular sequence of events following plant stress, and particularly light stress. This research may one day help us make crops more resilient to the changing climate. Apart from research, Marta loves to discover new ways to tell stories – human or scientific. She also enjoys embroidery and hiking. She is excited to TA for you this semester and answer any questions you may have!

Notes about Marta's role in course
Marta will assist Dr. Orchard by grading some Exam and Quiz questions, grading all the Discussions, and providing feedback on the Literature Review papers for half the students in the class (Dr. Orchard will do the other half). Marta is a talented scientist so you can ask either her or Dr. Orchard your questions about the course material or, better yet, post your questions in the Questions about the course Discussion forum. For questions about personal issues, such as illness or other challenges with participating effectively in the course, please always contact Dr. Orchard privately, via email orchard@arizona.edu.
Texts, Articles, and Other Course Materials

You will need the following in order to participate in this course.

Required

Texts:
- There are no required textbooks.
- All required readings will be available via the course's D2L site.
  - Unless a reading is marked 'Optional', it is required, and you may be tested on your understanding of the required readings.

Hardware:
- Access to a computer that meets the minimum requirements for D2L.
Activities and Graded Assignments

Getting Started
Read all the documents in the Getting Started and Syllabus and Course Organization sections to familiarize yourself with the course structure, policies, and evaluation/grading methods.

Materials
- Getting Started starts here
- Syllabus and Course Organization starts here

Graded assessments/evaluations
- Discussion 1: Introduce yourself
- Syllabus Quiz

Module 1: Biomolecules
There are no presentations/lectures in this short module. Instead, this module consists of a series of videos and an activity intended to make sure all students have the same basic understanding of biomolecules. For some students, this might be a repeat of what they learned in high school and for others, it might be new information. This module serves to give all students the background information they need for this course. To start off this module, you will learn about four major biomolecules: nucleic acids (e.g., DNA), carbohydrates, lipids, and proteins. Because DNA and proteins are so important in the field of Biotechnology, you will then complete a couple of activities designed to give you a better understanding of DNA - what it is, how it is structured, where it is in the cell, and what various words about DNA mean - and its relationship to proteins. We will use the terms and fundamental information you learn here throughout the rest of the course so it is imperative that you take the time to understand this material.

Module material
- Start Module 1 here

Graded learning assessments/evaluations
- Quiz 1.1: Biomolecules
- Quiz 1.2: DNA, RNA, and proteins
- Quiz 1.3: DNA structure and organization

Module 2: Microbial biotechnology
You will start off this module watching a presentation on the history of biotechnology, to help you get a feel for what biotechnology is and where the field got its start. After that, you will watch a presentation on molecular cloning, which is a fundamental technique used in biotechnology. *NOTE: molecular cloning is not the same thing as cloning animals or humans!* We'll cover that later in the course.

You will then start applying your newfound knowledge - you will learn about microbial biotechnology, which is the use of microscopic organisms to produce products. We will take an in depth look at the microbial production of insulin (to treat diabetes) and chymosin (to make curds in cheesemaking). Through these examples, you should gain a better understanding of how genetically-modified organisms (GMOs) are made and some of the useful and important things they do for us.

Module material
- Start Module 2 here

Graded learning assessments/evaluations
- Playposit quizzes embedded in presentations
- Quiz 2.1: Biotechnology and molecular cloning
- Quiz 2.2: Insulin
- Quiz 2.3: Cheesemaking and chymosin
- Discussion for Module 2: Should FPC-produced cheese be labeled as GMO?
- Exam 1: Modules 1 and 2

Module 3: Bacteria, antibiotics, and our microbiome
This module covers bacteria, antibiotics, and the human gut microbiome. You'll start off watching a TED talk about the human microbiome, which demonstrates the inter-connectedness of this module's topics and will hopefully spark your interest in learning more about bacteria (that make up much of the microbiome) and antibiotics (which can negatively affect the microbiome).

Module material
- Start Module 3 here

Graded learning assessments/evaluations
- Playposit quizzes embedded in presentations
- Quiz 3.1: Microbes and bacteria
- Quiz 3.2: Antibiotics and antibiotic resistance
- Quiz 3.3: Microbiomes
- Discussion for Module 3: Ethics of exploring the microbiome of native peoples

Assignment due
Module 4: Viruses, vaccines, and biological weapons

In this module, we will look at viruses, vaccines, and biological weapons. After learning the basics about viruses and vaccines, we will focus in on the SARS-CoV-2 virus, which is the virus that causes the coronavirus disease, COVID-19. We will then look into some of the vaccines strategies that are in use to prevent COVID-19 and pharmaceuticals that are being tested to determine if they can safely treat COVID-19.

Module material
- Start Module 4 here

Graded learning assessments/evaluations
- Playposit quizzes embedded in presentations
  - Quiz 4.1: Viruses and vaccines
  - Quiz 4.2: Vaccines and COVID-19
  - Quiz 4.3: Biological weapons
  - Discussion for Module 4: Mandatory vaccination laws
- Exam 2: Modules 3 and 4

Module 5: Plants

Plants feed and clothe us, absorb carbon dioxide from the atmosphere and emit oxygen, provide shade and beauty, protect our coastlines from erosion, and can be used to make biofuels. But climate change threatens to disrupt where and when plants grow - and at the same time, we will need more and more from plants as our human population grows and we look to biofuels to mitigate the effects of burning fossil fuels.

In this module, we will first look at how we grew plants before biotechnology: plant domestication and traditional plant breeding. Then, we will focus the role that biotechnology plays in putting food on our tables, via plant genetic modification - this includes how GMOs are made.

Module material
- Start Module 5 here

Graded learning assessments/evaluations
- Playposit quizzes embedded in presentations
  - Quiz 5.1: Plant breeding and genetic modification introduction
  - Quiz 5.2: Herbicide and Pest tolerance in plants
  - Quiz 5.3: Pest resistance, biopharming, and marker-assisted selection
  - Discussion for Module 5: Bt cotton in India

Assignment due
- Literature review paper part II

Module 6: Enzymes

In this module, we will take a look at the biological catalysts, enzymes. After learning the basics, we will look at the main types of enzymes used industrially and then go in depth on some applications for industrial enzymes: bread baking, laundry detergent, animal feed, and biofuels. We will spend some extra time on biofuels - specifically, bioethanol and bio-oil.

Module material
- Start Module 6 here

Graded learning assessments/evaluations
- Playposit quizzes embedded in presentations
  - Quiz 6.1: Enzymes
  - Quiz 6.2: Industrial enzymes
  - Quiz 6.3: Biofuels
  - Discussion for Module 6: Post a photo of a product of biotechnology
  - Exam 3: Modules 5 and 6

Module 7: Animals

In this module, we are going to look at animals in biotechnology in two parts - animal cloning and animal biotechnology. We will start by going over cloning in general then look at the main method used to clone animals, Somatic Cell Nuclear Transfer (SCNT). After that, we will look at some of the problems associated with cloning animals, including endangered or extinct animals. We will then move on to animal biotechnology, which includes the genetic modification of animals for research, food, and pharmaceutical purposes. After getting a feel for the breadth of applications possible for genetically-modified animals, we will take an in depth look at animals that have been genetically-modified to make pharmaceuticals and a genetically-modified salmon that has been approved for human consumption. This salmon will also be the topic of our class discussion this module - would you eat it?

Module material
- Start Module 7 here

Graded learning assessments/evaluations
- Playposit quizzes embedded in presentations
  - Quiz 7.1: Cloning and SCNT introduction
  - Quiz 7.2: Cloning applications and problems
  - Quiz 7.3: Animal biotechnology
  - Discussion for Module 7: GMO salmon debate

Module 8: Humans

- Literature review paper, part I
This module, we will learn about genetically modifying humans as well as a couple of potential applications of these technologies: ‘designer babies’ and treatment of genetic diseases. We’ll also look at three ways biotechnology is being used to treat cancer.

For the portion of the module on treating genetic diseases, we will focus on Duchenne Muscular Dystrophy and will take an in-depth look at the various gene therapies (e.g. CRISPR) being considered or tested to treat it. This module will take you more in depth into some scientific concepts than we have previously gone - take the time to understand the materials I have provided and you should do fine. If necessary, go back and review the information on DNA and proteins from Module 1, as you will need a good understanding of DNA, RNA, proteins, and ribosomes.

Module material
- Start Module 8 here

Graded learning assessments/evaluations
- Playposit quizzes embedded in presentations
  - Quiz 8.1: IVF and PGD
  - Quiz 8.2: CRISPR in humans and Cancer therapies
  - Quiz 8.3: DMD
- Discussion for Module 8: Will genetically-superior babies become another status symbol for the rich?
- Exam 4: Modules 7 and 8

Assignment due
- Literature review paper, part III

Important
Info: Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.
Grading Policies

This course follows grading policies established by the University of Arizona.

Grading Scale
A = 90% (900 points) and above
B = 80% - 89.9% (800-899 points)
C = 70% - 79.9% (700-799 points)
D = 60% - 69.9% (600-699 points)
E = 59.9% (599 points) and below

Overview of Graded Activities [1000 points possible]
See more details for these activities, below

Playposit (embedded) Quizzes [150 points]
You will be graded on 50 quizzes embedded into the presentations for the course, each worth 3 points. Please see additional information, below.

D2L Quizzes [230 points]
The Syllabus Quiz is worth 10 points. Every subsequent Module has 3 self-standing Quizzes, each worth 10 points. For Spring 2021, I will drop your two lowest D2L Quiz grades, to allow our class to participate in the QuaRCS research study.

QuaRCS Research Study [20 points]
I have agreed to have our course participate in a research study for Spring 2021. This study requires you to complete two surveys - once at the beginning of the semester and one at the end. To acknowledge that your participation takes time, I will give you 10 points for completing each survey. I will not see your responses to the surveys - I will only be given a list of names for students who participated. If you do not participate, you will get 0 points.

Discussions [120 points]
There are 8 Discussions, each worth 15 points.

Exams [320 points]
There are 4 Exams. The first one, which covers less material, is worth 65 points. The other three are each worth 85 points.

Literature Review Paper [160 points]
There is 1 Literature Review Assignment, with 3 graded activities:

- Part I (30 points): topic, sources, and writing style sample check (mini paper)
- Part II (100 points): main assignment (full-length, best effort paper) [Note: it takes us a long time to grade these because we want to give you useful, personalized feedback. Thank you for your patience.]
- Part III (30 points): Part II revisions based on instructor feedback and your own re-appraisal of your writing (required regardless of score on Parts I and II)

Extra Credit [10 points]
You may earn 10 extra credit points by finding and sharing articles about biotechnology with the class and/or reading and responding to an article that another student shared. See full details under the Discussions tab or through this link: Interesting articles related to the course content (EXTRA CREDIT!)

Final Exam/Project
The 4th exam is non-cumulative and has the same format as the other exams but will take place on the designated final exam day for this semester and the available time is different to the other exam times.

Date and Time
Friday, May 7th, 12 am to 11:59 pm (times refer to availability window on D2L)

Links to more information:
- Final Exam Regulations and Information
- Final Exam Schedule

Writing Requirement
All Tier One and Tier Two General Education Courses are writing intensive. The University of Arizona policies for the writing component of General Education courses can be found here.

This is a Tier One General Education course and is thus writing intensive. The writing requirement will be fulfilled through long-form answers on Quizzes and Exams, participation in written Discussions, and the submission and re-submission of a Literature Review Paper (see below).

Details of Graded Activities
Playposit (embedded) Quizzes
There are questions and comments embedded into the course presentations (lectures), to help you focus your attention on certain points and for me to assess how well you are understanding the material. You can rewind the presentations to listen to a section of the lecture again, before attempting to answer a question, but you cannot...
fast forward. You must let the presentation run all the way to the end or your grade will not be recorded in D2L. You can re-watch or reattempt the entire presentation - if you only want to watch it again to improve your understanding of the material and not reattempt the quiz, be sure to click on the "play" symbol instead of "replay"; otherwise your first grade will be erased, as will the record that you watched it at all. If you would like to raise your grade on the presentation, click "replay" and answer all the questions again. You have unlimited chances to take the embedded quizzes to improve your grade. BUT, see the note below...

NOTE: I understand that it can be hard to answer all the questions correctly the first time. To avoid having students going back over (and over?) the presentations trying to get every question correct, I offer this: at the end of each module, I will give you a minimum grade of 90% for the Playposit Quizzes IF you watched the entire presentation before the module ended AND answered at least 50% of the questions correctly (there are about 5 questions per presentation, so you will typically need to answer 3 correctly). In other words, if you scored 50-89% on the quiz, I will manually raise your grade to 90%. If you already had 100%, you get to keep that. This deal expires at the end of each module (i.e., two weeks after it opens). After that, you can still get credit for watching the presentations and answering the embedded questions, but your grade will be automatically determined by Playposit and I will not adjust it manually.

D2L Quizzes

There are numerous short, open-book quizzes in each module. The aim of the short quizzes is to check your understanding of the material presented in the readings. To give you a feel for the types of questions you could encounter on the exams, ideally, you would ensure you understand the material before taking the quizzes and thus also need any notes. However, you may refer to your notes or course material when you are taking the short quizzes. The quizzes can be accessed through the Content page for each module or through the 'Quizzes' tab. The answer key for the quizzes will be visible the morning after the quiz end dates; please review your answers compared to the key to enhance your understanding of the course material and to help you study for the exams.

Discussions

At the beginning of the course, you will introduce yourself to your classmates and your instructor using the Discussions tool available in D2L. In Modules 2-8, you will be asked to share your thoughts on a topic that you read about in an assigned reading. For all the these Discussions, you will also be asked to provide feedback to another student's post and other students could provide feedback on your post. For all but the first Discussion, you will not be able to see other students' submissions until you have provided your submission. There are points assigned to your participation in these events. Be respectful of your fellow students – it is okay to disagree, but if you do disagree with what they have written, keep your feedback directed at the idea, NOT at the person who wrote it or others who might have the same idea. I will deduct points for comments I deem inappropriate. The 'due date' for your participation is noted in each Discussion.

Exams (long 'quizzes')

There are 4 longer exams that occur periodically over the course. The exams are 'open-book'. Do not fall into the trap of thinking that means you do not need to study and prepare for it ahead of time! Because the exams are open book, you will be asked some intellectually-challenging questions that will require you to apply the information you have learned. While you'll be able to look up information during the exam, it would likely take you hours to look up all of the information, process it, and answer the exam questions if you do not prepare ahead of time. And, I suspect you and your brains will get worn out from hours of that. The questions will be an assortment of Written Answer*, True/False, Multiple Choice, Ordering, Matching, and Fill in the Blank questions. No sample tests will be provided but some of the questions in the exams could be the same questions in the short quizzes that you took in the modules. Use the learning objectives for each module (found under the lead in "At the end of this module, you should be able to...") at the top of each module page as your study guide. Unless otherwise noted, ALL material not marked as 'optional' in the module could be tested on, including videos and readings. Exams are not cumulative, per se, but understanding the concepts in previous modules will help you in subsequent modules.

NOTE: These questions will require you to write several sentences for your answer and will thus contribute towards the writing requirement for this General Education course. You will need to address all elements of the question and provide thoughtful, well-written, complete answers to get full credit.

Literature Review Paper

Because this is a Tier 1 General Education course, it is writing intensive. In addition to the writing you are required to do in the Discussions and the Written Answers on the Quizzes and Exams, there is a significant Literature Review Paper writing assignment. The instructions for this assignment are given in the folder for each part of the assignment (see Part I to get started) under the Assignments tab in D2L and additional information is provided below. You will submit your writing assignments via the appropriate Assignments folder in D2L and your paper will be automatically checked for plagiarism by Turnitin. The TA or I will make suggestions for improvement on your paper in Part I and Part II of the assignment and I expect you to improve your writing based on that feedback, especially for the resubmission, which is due later in the semester. The resubmission is not optional or extra credit - it is a required assignment for all students, regardless of grade on the initial paper. Papers will be graded in order received. Microsoft Word-compatible documents (.docx or .doc) and .pdf files are accepted.

To understand what is expected for the literature review paper, refer to the specific instructions in the Part I, Part II, and Part III folders under the Assignments tab and also read this additional, more general information about the paper assignments:

What is "literature"?

For the purposes of this assignment, literature is any printed or recorded material that has information on your chosen topic. You should use reputable sources of information but I generally discourage the use of technical papers written by scientists for scientists, because they are likely too technical/challenging for most students in this course. However, if you feel like you can understand those papers, you are free to use them. For more information, see the Assignment instructions for links to websites with more information on this style of paper and on choosing appropriate sources.

Paper topic

The specific topic for your paper is up to you but should be about Biotechnology (which will be defined at the beginning of Module 2) and related to one aspect of the course material - see the Course Schedule for more information and my Ideas for paper topics. Your paper should be a more in-depth look at your chosen topic than how I cover it in this course, meaning that you will need to do additional independent literature research on topics covered in this course and will not be able to rely solely on the course material, though you can and should use that, too, if your topic is covered in the course - be sure to cite/reference the course material you used. To help you source credible and appropriate sources of information, you must submit your topic and at least three sources of information in Part I of the overall assignment. A member of the teaching team (either I or the TA, for semesters when there is a TA) will provide you feedback on the suitability of your topic, chosen references, and writing style and you are expected to incorporate that feedback for the main submission of your paper, in Part II.
I do not accept most uses of quotes in the literature review papers for this course. To demonstrate your understanding of the source material you reference in your paper and to practice expressing information, you must put information you find into your own words (i.e., paraphrase) rather than just putting it in quotation marks. See information on how to paraphrase acceptably at the University of Arizona Libraries' website on avoiding plagiarism. A very rare exception of when a quote could be used for this course is when you want to convey the opinion of a specific person; most students should not have a quote in their paper so it is safer for you to not use them at all. DO NOT submit a paper that is mostly successive, lengthy quotes strung together with some of your own writing in between, as I will apply a heavy penalty for this. This might be a different to what other instructors have asked of you for their courses or from what you understand a 'literature review paper' to be. Please follow my rules for my course.

Citations and References

Your papers should cite the sources of information that you used while doing the literature research for your paper in two ways. Refer to the reference as an in-text citation* in the main text of your paper (I recommend the APA style for in-text citations and end-of-paper references, but I accept other styles as long as they are brief and clear) and then have the full information for the reference/source at the end of your paper, under the heading "References". See an example, below. I am a stickler for in-text citations and you will lose points for not using them or for not using enough of them.

Example of In-text Citation and Reference entry

In-text citation: "While COVID-19 and the flu are both caused by viruses, COVID-19 spreads more readily from person to person and can cause more serious symptoms in some people (CDC Symptoms)." Reference (at end of paper): "CDC Symptoms of Coronavirus website: https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html, accessed February 5"

Plagiarism - copying source material directly and/or only minimally paraphrasing source material

The papers must be your own work - the point of this assignment is for you to write about a topic yourself and practice your writing. I will deduct points for obvious plagiarism and if it is severe, I must turn it in to the Dean of Students Office (and I have a history of doing so for this course so this is not an idle threat). Do not copy your source material directly, even if you provide an in-text citation or reference (and even if you put it in quotation marks - that would not technically be plagiarism, but see notes about Use of quotes, above). Do not make only minimal changes to source material when you are paraphrasing (see information about "unacceptable paraphrasing" at the site linked to at the end of this paragraph). Do not turn anything into this class that you or another person have turned in to another class in part or in whole. Read more about plagiarism and how to avoid it here (but see my notes on the use of quotes, above): http://new.library.arizona.edu/research/citing/plagiarism

Turnitin Plagiarism Detection

When you submit your paper to the Assignment folder, the Turnitin software will automatically attempt to compare your paper against papers and websites in its database to look for similarities, which could be evidence of plagiarism (see above). Turnitin will generate two things that are useful here - it will highlight words/sentences in your paper that match sentences in its database and it will summarize these matches in the form of an 'originality score' for your submission. A high score (>15% or so) can be an early indicator to me of a problem in your paper, but it is not the only think I look at. When I read your paper, I will compare the highlighted sections with the matching items in Turnitin to determine if you have plagiarized sections of your paper. As noted above, I look for two main forms of plagiarism: verbatim (exact) copies of source material, where no words are changed, and inappropriate/unacceptable paraphrasing, where one or a few words in a sentence were changed, but the rest of it was left as-is. You will lose points for either form in this course. You can avoid either of these problems by not copying source material - instead, attempt to understand what you've read well enough that you can then retell it in your own words. While the score is less important to me than the comparison report (text highlighting), you should aim for a Turnitin originality score < 15%, not including the reference section. After you submit your paper, analyze the Turnitin report - you should not have more than about half a sentence highlighted at any point in the paper. Turnitin will attempt to recognize your reference section and not mark that as copied (you can't reword a website address, after all!), but if it does include that section in its report, don't worry about it - it will raise your score, but I won't consider it plagiarism, unless it's clear that you copied the reference section from somewhere else (e.g., someone else's paper). If you submit your paper and see that it has a high score (not caused by the reference section) and/or that it says you copied more than half a sentence in any place, you should edit your paper and resubmit it as long as it is still before the due date. I will grade only the most recent submission. Note that it takes a little while for Turnitin to generate a score. For that reason, I encourage you to try to submit your paper well before the cut-off time. Read more about Turnitin here.

Quality of writing

I attempt to take your familiarity/experience with English and with writing in general into account when grading your papers. That means, I try not to penalize students for incorrect use of the English language EXCEPT when there is evidence that the issues with the writing are a result of poor effort. I put a lot of effort into providing constructive feedback when grading papers because I want to help each one of you become a better writer, regardless of your writing level when you enter my course.

Honors Credit

Please contact Dr. Orchard if you are interested in an Honors contract for this course.
About Policies

Policies are a set of guiding principles for how you (the student), we (the instructors), and the university should act in a given situation. Read these policies carefully so you know what is expected of you as well as what you can expect from the course and the UA.

Course Policies

General course policies and requirements

1. All dates and times listed (e.g. for exam availability and Assignment due dates) are based on Tucson, Arizona time. The current 'local' time is indicated in a box on the course homepage.

2. Assignments, Quizzes, and Discussion contributions must be submitted by the required date and time or your grade will be diminished per the Late Policy for Graded Assignments, below.

3. Any work turned in on time will be graded as soon as possible. This is often done within ~2 business days of the due date with the following exceptions:
   - Part I of the literature review paper: up to 2 weeks (Fall/Spring) or 1 week (Summer)
   - Part II of the literature review paper: this assignment takes a significant time to read, grade, and provide meaningful feedback on, so please allow up to 5 weeks (Fall/Spring) or 2 weeks (Summer)
   - Part II of the literature review paper: up to 2 weeks (Fall/Spring) or 1 week (Summer)
   - Papers will be graded in order received
   - Items submitted late: the time taken for grading is likely to be longer, especially if we are busy with grading other items. Grading late submissions is a lower priority for the teaching team

"Attendance"

The course material for each module Module 1 should be completed by the relevant due date. To help you manage your time, I have broken the material into chunks and staggered the due dates for the Quizzes and Discussions within each module. The Late Policy for Graded Assignments, below, will apply to any of these items completed or submitted late, except in the event of an excused absence.

Communication Policy

Please see Instructor contact information on the Course Description and Instructor Contact Information page. You should check our course homepage on D2L for Announcements at least every 2 days for new information related to the course. Sometimes, I will send emails with important course information to the student email addresses on D2L - please ensure you check that email account daily as the information I send via email is often essential course information. I will hold you responsible for reading and following any instructions I send via email or which I post on the D2L course homepage.

Elective Name and Pronoun Usage

This course affirms people of all gender expressions and gender identities. If you are comfortable doing so, please provide this information to your classmates in Discussion 1: Introduce yourself. If not, please email me this information and I will endeavor to address you using your chosen name and pronouns. You may call me Dr. Orchard and use she/her/hers pronouns for me. Please correct me if I do not use your preferred gender pronouns and name. Please see Student Resources for information on how to change your preferred name and/or pronouns in the UAccess system.

Late Policy for Graded Assessments/Evaluations and Assignments

Grades for Quizzes, Discussions, and the paper Assignments will be reduced by 10% of the total value for that item for every day or part of a day it is late. I strongly recommend that you complete all assignments, even if you must submit them late, because they are an important part of the learning experience (and, of course, getting some points is better than getting no points). If you want to submit something more than 10 days late, please contact me to discuss it. I often allow students to submit Quizzes, Discussions, and writing Assignments very late, for a partial grade, if there is a reasonable excuse.

Late Registration - Makeup Policy

I will work with any student who registers late to catch up on course content and expect them to put in the extra effort needed to get caught up.

Notification of Objectionable Materials or Content Warning

There is one video that I think could be objectionable to some students. I have put a 'trigger warning' on that video and have provided an alternative video to watch. If you have emotional triggers or are particularly sensitive about some topics (such as infertility, birth defects, abortion, COVID-19, cancer, or genetic diseases, and especially DMD), please let me know what those topics are and I will work with you to identify any other material that could be objectionable and to find alternatives to that course material.

University Policies

Aggregated policies

Links to the following UA policies are provided at https://academicaffairs.arizona.edu/syllabus-policies:

- Absence and Class Participation Policies
- Threatening Behavior Policy
- Accessibility and Accommodations Policy
- Code of Academic Integrity
- Nondiscrimination and Anti-Harassment Policy
- Subject to Change Statement

By providing the link above, all University-wide policies listed above are incorporated into this syllabus in their entirety.

Incompletes (I) and Withdrawals (W)

Requests to complete this course in a future semester or to withdraw from this course must be made in accordance with university policies. To read the policies, click these links:

- Incomplete policy
- Withdrawal-policy
# January 2021

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Ideas for paper topics

For your paper assignment for this course, you need to research and write about a topic in biotechnology. I will assess the suitability of your topic in Part I of the writing assignment and let you know if it is not suitable for the Part I submission of your paper – the topic should be about biotechnology* and you should focus mostly on the scientific aspects (vs. political or cultural aspects, for example).

**“Biotechnology is technology that utilizes biological systems, living organisms or parts [thereof] to develop or create different products.”**

https://www.ntnu.edu/ibt/about-us/what-is-biotechnology

From past experience, I know that some students struggle to come up with a suitable topic on their own, which is understandable at the beginning of the course when most students haven't yet studied biotechnology! For that reason, I am providing the following suggestions, though you are not restricted to these topics. You are welcome to write to me at orchard@arizona.edu to get feedback on your topic even before you submit Part I.

Examples of what you CAN write about:

Here's a list of topics and/or specific examples we are going to study in the course and that you could write about – using one of these topics for the paper will then also help you understand the material better when we get to that section (if we haven't already covered it by the time you write your paper):

**Pharmaceuticals** – see: “biopharming” or “pharming” (pharmaceuticals produced in plants/animals) and also pharmaceuticals produced by microbes or other cells in culture. Examples:

- ATryn (made by genetically-modified goats in their milk)
- Elelyso (a.k.a. Taliglucerase alfa; made in carot cells; http://blogs.nature.com/news/2012/05/first-plant-made-drug-on-the-market.html)
- REGN-EB3, mAb114, and/or ZMapp (Ebola therapies)
- Herceptin and certain other monoclonal antibody therapies (cancer therapies)
- Kymriah and other CAR T-cell therapies (cancer therapies)
- T-VEC and other oncolytic viruses (cancer therapies)
- Recombinant insulin
- [Contact me for up-to-date suggestions about COVID-19 therapies you can write about - not all of them are biotechnology products.]

[Note that you can't just write about any pharmaceutical product, because a lot of them are not products of biotechnology, per se... the ones I've listed here ARE products of biotechnology.]

**Vaccines** – specifically, those that are produced in genetically-modified microbes, plants, or insect cells. Examples that are:

- Hepatitis B (recombinant version)
- Gardasil (against HPV, for prevention of cervical and certain other cancers)
- DNA-based equine West Nile virus
- Ervebo a.k.a. rSV-ZEBOV (Ebola)
- Flublok (Flu vaccine for people with egg allergies)
- Specific COVID-19 vaccines: the Moderna, Pfizer, and AstraZeneca/Oxford vaccines are all acceptable topics.

[Note that you can't just write about any vaccine, because a lot of them are not products of biotechnology, per se... the ones I've listed here ARE products of biotechnology. You should not also just write about vaccination and/or the controversy over mandatory vaccinations.]

**Animals** – Be sure to explain how and why the animal was genetically modified, if applicable. For animal cloning, explain the SCNT technique used. Examples:

- AquaAdvantage salmon (GM fish for consumption that should come to the US market very soon)
- OncoMouse (to test cancer therapies etc.)
- GMO pigs for xenotransplantation (to help supply organs to people in need of a transplant)
- Oxitec mosquitoes (to help control mosquito populations, to reduce incidence of malaria, Zika, Dengue, etc.)
- GloFish (fluorescent pets)
- Cloned pets (see the ViaGen Pets and Sooam websites) - describe what SCNT is

**Plants** – Any plant that has been genetically modified. Be sure to explain how and why the plant was modified. Examples (search "GMO crops"):  
- Herbicide tolerance (e.g. Roundup Ready crops)
- Insect resistance (e.g. Bt corn)
- Virus resistance (e.g. Rainbow papaya)

**Microbes** – Examples:  
- Fermentation-produced chymosin (FPC; used in cheesemaking)
- Antibiotics made by microbes (vs. those made through chemical synthesis in a laboratory, which is not an example of biotechnology)
- Probiotic supplements
- Biological weapons (e.g. anthrax, plague, and other bacteria or viruses that can be used as biological weapons)
- Algae used to produce biofuels

If you put some of those specific examples as search terms into a web browser, you can learn more about them. Hope you like one of those ideas!

Examples of what NOT to write about:

- Just writing about DNA, proteins, or other biomolecules (Module 1) on their own is not sufficient - I present this information in Module 1 because you need to know it to understand the rest of the course, but it is not ‘biotechnology’ by itself. You CAN write about these biomolecules IF you explain their importance to biotechnology. Do not write about 'protein shakes' or various diets related to carbs or protein etc.
- Just writing about vaccines generally is also not sufficient - if you choose this topic, you must write about the ways that biotechnology has advanced the development of vaccines and/or about specific vaccines that are products of biotechnology (see suggestions above)
- Don't just write about a disease, such as diabetes, unless you also write about how biotechnology has been used to treat diseases (e.g. how recombinant insulin is made - this will be discussed in Module 2), in which case you would write about the disease as part of the background information in your introduction, but you MUST also write about the biotechnology aspects of the disease treatment.
How to study for this course

Here are my tips for studying for this course:

- Print out the course schedule (this version is editable) and post it prominently in your room or add the due dates for this course to your digital planner - either way, be sure to check the calendar/planner frequently, to stay ahead of due dates
- Have a growth mindset - that is, believe that you can learn new things and that intelligence is a quality that can be developed
- Set aside 2-4 dedicated times to work on this course each week... and not just one hour before something is due! Perhaps you should add your study times to this calendar?
  - Research has shown that spacing out your study sessions is an effective studying habit and that cramming is not
- Print out the lecture slides and the terminology sheet for each module or use a device/software that allows you to electronically overlay your notes onto the lecture slides
- [MOST IMPORTANT] Actively watch my presentations, with the printed/digital lecture slides in front of you
  - Take notes on the lecture slides as you watch/listen, pausing the presentation as necessary
  - This is not a time to multi-task - if you find yourself distracted by your phone or a TV or other people, either change your situation/location or try again later, when you can devote your attention to the presentation
- Fill out the terminology sheets for each module as terms are defined in the presentations or other videos in the module
- Pay attention to my “what to watch for” notes for the non-presentation videos and some of the readings in each module. Ideally, you would print those out too or put them into an editable electronic file and take notes as you watch the videos or read the articles
- Have your notes and the terminology sheet handy when you take the module quizzes (open book but limited time)
  - Read quiz questions carefully before answering
- STUDY GUIDE: Use the learning objectives for each module as a guide to help you study - you should be able to do everything in the learning objectives by the end of the module; if you cannot, then post a question in the Discussion forum, email me (orchard@arizona.edu), or schedule an appointment with me.
- Before the exams, review your notes and the terminology sheet AND go back to the quizzes and check which answers you got right or wrong. Read the correct quiz answers. Test yourself on the quiz questions, the end-of-presentation questions, and on the terminology sheet. Organize your notes. Review the learning objectives for the relevant modules (see STUDY GUIDE, above)
  - Read exam questions carefully before answering

Struggling with this course for one reason or another? Let me know, and do it soon! Don't wait until the end of the semester. I am willing and able to meet with you in person or online to hear you out and offer advice. You might also want to contact your Academic Adviser.
Getting help with studying

If you find yourself struggling with this course, be sure to read my tips for studying for this course. If you have tried those tips and are still struggling, contact me or try one or more of the following:

**ThinkTank Academic Skills Tutoring** - drop in and by appointment.

From their website: “You know that THINK TANK has tutors for subjects like math and writing, but did you know that we also have tutors to help with study skills? Our Academic Skills Tutors (ASTs) are here to work with you individually on topics ranging from managing your time effectively to adapting your study strategies to meet the level of rigor required in college. Online courses require students to approach classes differently than in-person courses. If you are finding your online class confusing or challenging, an AST can provide guidance on how to navigate your online course from figuring out when things are due to effective study strategies for exams when there are no lectures.”

Read study tips from the Learning to Learn Initiative

Especially:

- **Retrieval Practice** - test yourself, to force yourself to recall something from memory
- **Spaced Practice** - space out your study sessions
- **Growth Mindset** - believe that you can improve your ability to understand material through dedication and hard work

Take a class about how to learn

- **Powerful Strategies to Improve Learning** (online; not credit based; FREE)
- **Student Advocates for Improved Learning (SAIL)** (PSY 397; 1 credit)
- **Learn to Teach to Learn** (AED 150A1; 3-credit general education course)

Read a book

- **Make it Stick** (free digital book via UA Libraries)

Fight off Imposter Syndrome

Do you feel as though you're not really meant to be here? That you're not as smart as other students? Then you, like many people, might have Imposter Syndrome. Know this: if you are registered for this course, then you are meant to be here and you can succeed. Here are some tips to fight off feeling like an imposter:

- **10 steps you can use to overcome imposter syndrome**
- **How to overcome imposter syndrome** (includes TED talk link)
Academic Advising for questions or concerns about your academic progress this semester

Academic Policies and Procedures

Active Shooter Preparedness: run -> hide -> fight

Campus Food Pantry (see below)

Confidentiality of Student Records

COVID-19 and the Coronavirus at UA

Dean of Students Office (see below)

English as a Second Language

Health & Wellness for Students, physical and mental (see below)

Honors Courses

Honors Contracts

Preferred name and pronoun change in UAccess (see below)

Student Assistance and Advocacy Information

Student Centers

The Think Tank
  - Academic Skills Resources

The Writing Center

The Writing Skills Improvement Program

Title IX sex discrimination and sexual harassment (see below)

Campus Pantry

Any student who has difficulty affording groceries or accessing sufficient food to eat every day, or who lacks a safe and stable place to live and believes this may affect their performance in the course, is urged to contact the Office of the Dean of Students for support. In addition, the University of Arizona Campus Pantry is open for students to receive supplemental groceries at no cost. Please see their website at: campuspantry.arizona.edu.

Dean of Students Office - for life challenges

If you are experiencing unexpected barriers to your success in your courses, please note the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office can be reached at 520-621-2057 or DOS-deanofstudents@email.arizona.edu.

Health and Wellness for students, physical or mental

If you are facing physical or mental health challenges this semester, please note that Campus Health provides quality medical and mental health care. For medical appointments, call (520) 621-9202. For After Hours care, call (520) 570-7898. For the Counseling & Psych Services (CAPS) 24/7 hotline, call (520) 621-3334.

Preferred name and pronoun change in UAccess

If you wish to change your preferred name or pronoun in the UAccess system, please use the following guidelines:

Preferred name: University of Arizona students may choose to identify themselves within the University community using a preferred first name that differs from their official/legal name. A student’s preferred name will appear instead of the person’s official/legal first name in select University-related systems and documents, provided that the name is not being used for the purpose of misrepresentation. Students are able to update their preferred names in UAccess.

Pronouns: Students may designate pronouns they use to identify themselves. Instructors and staff are encouraged to use pronouns for people that they use for themselves as a sign of respect and inclusion. Students are able to update and edit their pronouns in UAccess.

More information on updating your preferred name and pronouns is available on the Office of the Registrar site at https://www.registrar.arizona.edu/

Title IX - sex discrimination and sexual harassment

The University of Arizona is committed to removing educational barriers created by sex discrimination and sexual harassment. Sex discrimination under Title IX can include acts of violence based on sex, such as sexual assault, domestic violence, dating violence, and stalking. If you (or someone you know) has experienced or experiences any of these incidents, you have options for help at the University. The University of Arizona has staff members trained to support you in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more.

Please be aware that UA faculty and instructors who work with students are required to report allegations of sex discrimination to the Title IX Office. This means that if you tell me about a situation involving sexual harassment, sexual assault, dating violence, domestic violence, or stalking that involves another student or employee, or that happens on campus or in a UA program, I must share that information with the Title IX Coordinator. Although I have to make that notification, you will have choices regarding whether or not you want to pursue a formal complaint against anyone on campus. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

If you wish to speak to someone privately, you can contact any of the following on-campus resources:

- Counseling & Psych Services (CAPS), https://health.arizona.edu/counseling-psychservices, (520) 621-6490, (520) 570-7898 (after hours)
- Oasis Sexual Assault, Relationship Violence, and Trauma Services, https://health.arizona.edu/counseling-oasis (same phone as CAPS)
- Campus Health, https://health.arizona.edu/home, (520) 621-6490
- University of Arizona Ombuds, https://ombuds.arizona.edu/, (520)-626-3589
- Title IX section on sexual assault support & resources (https://titleix.arizona.edu/titleix/sexual-harassment-violence) has more information, as well as a link explaining options if you have a concern, need assistance/support, or would like to file a complaint.