Syllabus and Course Organization

Course Objective and Learning Outcomes:

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

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

- describe examples of what biotechnology has to offer for feeding and fueling the world’s growing human population, improving the productivity and health of plants and animals, preventing and treating human diseases, and more;
- analyze the advantages and disadvantages of various biotechnology approaches using an objective scientific approach;
- communicate an opinion on the ethical, social, or financial aspects of biotechnological approaches to solve challenges facing the world.

Due: Thursday, January 16th
- Quiz 1.1

Due: Sunday, January 19th
- Survey 1

Students who register for the course late or contact me will be given extra time to complete these two items.

Course Description and Instructor Contact Information

What would you like to get out of this course? Read the course description and instructor contact information, take some time to reflect on what you want to get out of this course, then record your answers to the survey questions.

Survey 1: Set your course goals

Survey

 Starts Jan 6, 2020 12:00 AM

Required Course Materials

Required Course Materials

Course Activities and Graded Assignments

Course Activities and Graded Assignments

Grading Policies and Graded Items

Grading Policies and Graded Items

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

Policies

Printable Calendar of Due Dates

Printable Calendar of Due Dates

Here is a printable calendar showing the due dates for this course.
Editable Calendar of Due Dates
Excel Spreadsheet

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.

Ideas for paper topics
Web Page

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

How to study for this course
Web Page

Getting help with studying
Web Page

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

Student Resources
Web Page

FAQs
Web Page

Quiz 1.1: Course Organization
Quiz
Due January 16 at 11:59 PM  Starts Jan 6, 2020 12:00 AM

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!
Modern biotechnology has answers to the questions: How are we going to feed and clothe all the people in the world as the population gets larger and larger? How are we going to fight diseases? How are we going to be more sustainable? But the use of Biotechnology is controversial. 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 include: engineering transgenic pet fish, cloning pet dogs, biowarfare, making biofuels, producing pharmaceuticals in the milk of various animals or in plants, and developing cures or preventative for human ailments.

**Course Format**
The course is broken into 8 modules, each centered around a different topic. The first, introductory module is less than 1 week long, and the remainder are each 2 weeks long.

The course format includes reading and video viewing assignments, presentations (lectures) with embedded quizzes, online activities, stand-alone quizzes, writing assignments, discussions, and exams.

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 and be sure to check into D2L regularly to look for upcoming deadlines!

**Professor**
Samantha Orchard, Ph.D. [please call me “Dr. Orchard”; she/her/hers]

**Office Location**
Marley 541D (UA Tucson main campus)

**Telephone Number**
520.621.3969 (~8:30 am to ~ 5 pm, weekdays)

**Email Address**
orchard@email.arizona.edu

**Office Hours (time to meet with instructor one-on-one)**
Wednesdays, 1:30-3 pm or by appointment. I am able to meet with you in person or by video chat. Don't be shy about asking to meet!

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

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**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.

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**Additional Instructor Contact Information**

**Graduate Teaching Assistant**
Elizabeth Bowman [please call her “Liz”; she/her/hers]

**Email Address**
eabowman@email.arizona.edu

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**Note!**
You will be notified, in advance, of any scheduling issues that may impact my response times.
Liz is a PhD student in the School of Plant Sciences. She holds a B.S. degree in Botany from Oregon State University and a M.S. degree in Plant Pathology from the University of Arizona. Currently, she works with Dr. Betsy Arnold studying plant-fungal symbioses. In her doctoral work, she is study how abiotic (non-living) and biotic (living) factors related to climate change shape communities of fungal symbionts associated with Ponderosa pine (*Pinus ponderosa*) across isolated montane forests in central and southern Arizona. In her free time, she enjoys any activity that takes her outdoors including hiking, camping, and nerding out on plants. She is excited to be assisting Dr. Orchard with PLS 170C2 this semester.

Note about Liz’s role in course

Liz will assist Dr. Orchard by grading some Exam and Quiz questions, grading all the Discussions, providing feedback on the Literature Review papers for half the students in the class (Dr. Orchard will do the other half), and answering some of your questions about the course material. You may contact Dr. Orchard or Liz for questions about the course material. For questions about course logistics, please always contact Dr. Orchard.
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
- Survey 1: Set your course goals
- Quiz 1.1: Course Organization

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 is 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. We will use these terms 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 1.2: Biomolecules
- Quiz 1.3: DNA, RNA, and proteins
- Quiz 1.4: 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: 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
- Literature review paper, part I
Module 4: 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 Ebola virus - as you might have heard, there is an ongoing Ebola outbreak that started in April 2018 in the Democratic Republic of Congo (DRC), although it is smaller than the 2014-2016 outbreak and is not getting as much media attention. While this outbreak was initially being well-contained, problems with violence and mistrust of medical professionals in the area led to flare ups. More recently, there were signs that the DRC outbreak is finally being reined in and the number of new cases has been waning since late 2019.

The containment that has been achieved for this outbreak has been possible in part because of the availability of experimental vaccines and treatments for Ebola, thanks to Biotechnology and genetic engineering. We will learn how one of the vaccines and one of the treatments are made. The development of at least one of the treatments was funded by the US Department of Defense, because of the concern that Ebola could be used as a biological weapon, which is another topic that will be covered in this module.

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 Ebola
- Quiz 4.3: Biological weapons
- Discussion for Module 4: Deciding who gets an experimental treatment
- 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, and protect our coastlines from erosion. 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.

In this module, we will focus on plants and will ultimately look at the role that biotechnology plays in putting food on our tables and pharmaceuticals on the shelves. But first, we need to understand plant domestication and traditional plant breeding. We will then take a more in depth look at three reasons plants have been genetically modified: herbicide tolerance, insect resistance, and the production of pharmaceuticals. Finally, we will briefly look at a tool used in advanced breeding to speed up the process of traditional, selective breeding.

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. Along the way, you will find out the answers to a couple of questions that I bet you weren't expecting in a course on Biotechnology - why is the crust of cold pizza so hard and what is the best way to re-heat it?

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 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
Module 8: Humans

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?
- Survey 2: Reflect on your efforts in this course
- Exam 4: Modules 7 and 8

Assignment due

- Literature review paper, part III

Important

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% and above
B = 80 · 89.9%
C = 70 · 79.9%
D = 60 · 69.9%
E = 59.9% and below

Overview of Graded Activities [1000 points possible]

See more details for these activities, below

Surveys [20 points]
There are 2 Surveys for the course, each worth 10 points. One will be available for the first few days of the course and the other will be available near the end of the course.

Playposit (embedded) Quizzes [150 points]
You will be graded on 50 quizzes embedded into the presentations for the course, each worth 3 points. For any additional quizzes over 50 (there are currently 53), your lowest grades will be dropped, so only the top 50 grades will count. Please see additional information, below.

D2L Quizzes [250 points]
Every Module has 3 self-standing Quizzes and there is one additional initial quiz on course organization. Each one is worth 10 points.

Discussions [105 points]
There is one Discussion at the end of Modules 2-8 (i.e., 7 total), 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 [155 points]
There is 1 Literature Review Assignment, with 3 graded activities:

- Part I (25 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 first designated final exam day for this semester and the available time is different to the other exam times.

Date and Time
Friday, May 8th, 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

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

Surveys
There is a survey at the beginning of the course that I use to find out more about you and also to have you set a grade goal for the course. At the end of the course, there is another survey that asks you to reflect on your performance in the course. If you complete each survey, you will get full credit for these 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 "retry", 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 "retry" 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 attempted to answer every question AND answered at least 50% of the questions correctly (there are typically ~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., the same day and time that the Discussion for the module is due). 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 in presentations and other readings/viewings periodically and 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 quiz and would thus not 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**

In Modules 2-8, you will be asked to share your thoughts on a topic through the Discussions tool available in D2L. You will also be asked to provide feedback to another student's idea/point of view on a topic and other students could provide feedback on your idea/point of view. 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. Please 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 intellectually-challenging questions that will require you to apply the information you have learned. There is also a time limit on the exams. Taken together, that means that you will still need to prepare for the exams and you will not be able to do very well if you simply start the exam and then try to look up all the answers. 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 as 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.

*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. 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 documents (.docx or .doc) are slightly preferred but .pdf files are also 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:
Honors Credit

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 the course material. 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) 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.

Use of quotes
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) then have the full information for the reference/source at the end of your paper, under the heading "References". *I am a stickler for in-text citations and you will lose points for not using them or for not using enough of them.

Turnitin
Read more about Turnitin here. Aim for a Turnitin originality score <10%, not including the reference section. Turnitin will attempt to recognize your reference section and not use that section to calculate the originality score, but if it does include it, you can try submitting your paper without the references to check the score, then add the references back for the final submission. Your Turnitin score will be automatically generated when you submit your paper to the Assignment folder in D2L - you do not need to go to the Turnitin website, as the service is integrated into D2L. If you submit your paper and see that it has a high Turnitin score, you are welcome to 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.

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.

Plagiarism
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
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 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 will be graded as soon as possible. Part II of the literature review paper takes a significant effort to read, grade, and provide meaningful feedback on, so please allow up to 5 weeks (Fall/Spring) or 2 weeks (Summer) to get a grade on that assignment. Papers will be graded in order received.

"Attendance"
The course material for each module is available for a 2-week window, except for Module 1, which is available for less than 1 week. Students may decide for themselves when to access the material within the time frame for each module; however, I have staggered the due dates for the Quizzes within each module, so you have less time to complete those. I recommend that students do not wait until the end of the availability period to work on the material, to avoid issues related to illness and other time commitments. Because the material is available for so long, the Late Policy for Graded Assignments, below, will apply to any of these items completed or submitted late, except the the rare event of an excused absence.

Communication Policy
Please see Instructor contact information on the Course Description and Instructor Contact Information page. You should check 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
I ask for this information in Survey 1. You may also 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.

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, please let me know what they 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
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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/bi/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@email.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)
- Ruconest (made by genetically-modified rabbits in their milk)
- Elelyso (a.k.a. Taliglucerase alfa; made in carrot 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

[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. rSVV-ZEBOV (Ebola)
- Flublok (Flu vaccine for people with egg allergies)

[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 also not just write about vaccination and/or the controversy over mandatory vaccinations.]

Animals – Examples:
- AquaAdvantage salmon (GM fish for consumption that should come to the US market in late 2020)
- 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 Soam websites)

Plants – Any that has been genetically 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:
- "Industrial enzymes" made by microbes and used in laundry detergent, baking, biofuels, animal feed, and more
- 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 2-3 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
- Watch or at least listen to 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
- 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
- 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@email.arizona.edu), drop in during my office hours, or schedule an appointment with me.
- Before the exams (open book but limited time), 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.
  - 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)
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 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.

Links to Additional Resources

- Academic Policies and Procedures
- Confidentiality of Student Records
- Dean of Students Office
- Health & Wellness for Students
- Honors Courses
- Honors Contracts
- Student Assistance and Advocacy Information
- Student Centers
- The Think Tank
- The Writing Center
- The Writing Skills Improvement Program