Course Description
Medical biotechnology is defined as a “branch of medicine that uses living cells and cell materials to research, and then produce pharmaceutical and diagnosing products to help treat and prevent diseases” (Western Governors University, 2018). Biotechnology has become gradually more integrated in modern medicine, making strides in improving patient health. The medical advancements being made in biotechnology have provided new methods for disease treatment, disease prevention, and reproductive access through the development of stem cell research, genetic editing and genetic screening. Although biotechnology has promising results, it also gives rise to many ethical concerns such as eugenics, equity, privacy and patient rights.

The goal of this course is to develop students’ understanding of the capabilities that biotechnological therapies provide as well as the pitfalls to the implementation of utilizing biotechnological therapies in modern patient care. Students will gain an understanding of the ethical implications of current and emerging medical biotechnologies to be able to better understand its relevance in culture and its role in physician-patient relationships. The main emphasis of this course will be: understanding uses of different medical biotechnologies, its impacts on patient care, as well as how it may impact society in the future. Additionally, students will work on developing public policies that can be implemented to regulate biotechnological research and development as well as its use on patients.

Learning Outcomes
Upon completion of this course, students who have completed the readings and participated in discussion should be able to:

1. Understand the science behind stem cells, gene editing, genetic screening, and reproductive technologies and be able to engage in ethical dialogue around the use of these biotechnological therapy methods.

2. Understand the complexity of ethical dilemmas behind the use of biotechnological therapies regardless of the positive outcomes that they can potentially produce.

3. Effectively articulate informed thoughts and opinions on the use of different kinds of biotechnological therapies and their implementation in medicine.

4. Develop public policy for the regulation of biotechnological research and its therapeutic use in medicine.
Course Structure
Instruction days will be on Tuesdays and Thursdays for 120 minutes for each session. This course will be divided into three units: Disease Treatment, Disease Prevention, and Reproductive Access - each unit will focus on a specific biotechnological therapy that treats the overall concern. In the first week of each unit students will be provided a short introduction to the scientific background behind the biomedical technology that we will be centering our ethical conversations around for the duration of the unit. The three main biotechnological therapies that will be discussed are: Stem Cells, Genetic Editing, and Genetic Screening (among others, when applicable). Each unit will cover 4 weeks; the first week will cover the scientific background behind the biotechnology and the following three weeks will cover the ethics related to that area of treatment. At the end of the first and third weeks of every unit, students will respond to readings in a discussion post. Additionally, at the end of the fourth week of each unit students will turn in a unit paper on a topic of interest to them that relates to the unit. These assignments are designed to help students practice engaging in ethical dialogue as well as form opinions and arguments of their own on bioethical topics. The last 3 weeks of the course will be dedicated to work-time and presentations of the final policy project. Presentation of Final Project (Public Policy Development) papers will occur during the last two weeks of the course. These presentations will be focused on highlighting the bioethical dilemma present with their chosen biotechnology therapy. Then students will provide potential solutions to solve/mitigate the impacts of the bioethical dilemmas at hand through the policy that they have developed through a bioethical framework.

Course Expectations
Students will be expected to complete all of the assigned materials in this course and be ready to discuss them in class. Participation during class discussions is required and will be graded based on engagement and thoughtfulness. Students are encouraged to collaborate with one another outside of class on the “asynchronous open discussion board” on Canvas to discuss readings and other topics of interest on their own time if topics are not brought up during in-class discussions. Course Assignments should be completed in a timely manner; any requests for extensions must be communicated 48-hours or more prior to the due date or it will not be granted.

Grade Distribution
Unit Papers - 45%
Discussion Posts - 20%
Final Paper - 20%
Participation - 15%
Assessments

Unit Papers (Total 3 | 15% each). You will be required to write three papers throughout this course, each will be on a topic of interest to you that relates to one of the units we will cover in class. The three unit topics will be (1) disease treatment (stem cells), (2) disease prevention (gene editing), and (3) reproductive access (genetic screening). For each paper, you will need to compose a 5-8 page argumentative or op-ed paper which utilizes at least 5 primary sources. These papers should be free of errors, reflect an argument or opinion on a topic of your choice that relates to the unit, and include credible sources.

Discussion Posts (Total 6 | 3.5% each). You will be required to write a total of six discussion posts this semester. During each of the three units, you will respond with one discussion post on the scientific background readings and one discussion post about the ethical considerations. For each discussion post you will be asked to provide a 250-500 word response to the assigned readings, reflecting on what you learned, your response to the author’s assertions, and any questions you may have about the topic. Your responses should be thoughtful and engaging, have page references to the readings, and reflect your understanding of the assigned readings. In addition, you will be asked to respond to at least two of your peer’s posts for each of these assignments. These responses should be thoughtful and engage with the assertions and thoughts presented in the post (not just “I agree” statements).

Final Project - Public Policy Development (20%). For your final project in this course, you will be turning in a 12pt. Times New Roman double spaced 7 - 10 page policy paper on a biotechnological therapy of your choice and how its use can be implemented. The guidelines for this assignment are based on Luciana Herman’s “Tips for Writing Policy Papers” (Herman, 2013). The final paper will need to include the following components: Executive Summary, Introduction (Background), Literature Review, Policy Context, Analysis of Findings (Evidence), Policy Options (Recommendations), Implementation (Next Steps), Conclusion, Appendix (Figures/Tables/etc), and Bibliography. This paper can either be done individually or in pairs and will be graded on clarity, breadth of content, ethical analysis, source quality, and overall accomplishment in developing a usable policy. Students are expected to apply their knowledge of the science behind the biotechnological therapy as well as thorough ethical analysis to create a public policy that is reasonable and remedies any ethical concerns regarding the use of the therapy in mainstream healthcare.
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<th>Week</th>
<th>Day of the Week</th>
<th>Week Topic</th>
<th>Readings</th>
<th>Assignments</th>
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<tr>
<td>1</td>
<td>Tu</td>
<td>Stem Cells (Science Background)</td>
<td>Chagastelles et al. (2011): pages 1-4</td>
<td>Discussion Post 1</td>
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<td>Moradi et al (2019): pages 1-4</td>
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<td>Master, Z. et al. (2017): pages 177–179</td>
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<td>Disease Treatment Ethics</td>
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<td>Shen, S., et al. (2017).: pages 20 - 25</td>
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<td>Genetic Screening (Science Background)</td>
<td>Burke et al (2011): pages 148-164</td>
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<td>Reproductive Access Ethics</td>
<td>Segers et al (2017): pages 1620-1632</td>
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<td>Capstone Presentations</td>
<td>Final Project Due on Canvas</td>
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Course Readings and Rationale for Usage in Course


- This text focuses heavily on the Affordable Care Act (ACA/Obamacare) and analyzes this comprehensive federal healthcare legislation and the controversy that surrounded it. This book will be critical to our proposed course’s capstone project in writing a policy to help with the regulation of the use of biotechnology in healthcare settings in the U.S.

- **Optional Reading**


- General Article discussing the science and usage of different types of stem cells that are acquired in for this type of treatment

- **Read pages: 1 - 4**


- This source delves into the deeper discussions about the policy-making process of regulating the use of stem cell research.

- section on "Social Justice and Allocation of Limited Resources" is relevant to the class topics for equity/accessibility to use biotechnology

- **Read pages: 1 - 9**


- discusses the ethical issues with human gene patenting which arise from the development of genetic screening, editing, and therapy in medicine.

- We can use these sources to introduce students to some of the issues that they will have to consider when developing their policies for regulating biotech medicine.

- **Read pages: 211 - 221**


- This is a good article to reference for this course because it provides an analysis looking at both sides of opinions regarding the development of biotechnology and how developers oftentimes neglect the potential negative impacts it has alongside the positives. The author, Tom Koch, is a well established bioethicist from Canada who is
published and referenced in works regarding technology, medicine, philosophy and bioethics.

- **Read pages: 685 - 699**


- Reviews the ethics of genomic tech. Author proposes an argument outlining a new approach to the ethics of reproductive genetic engineering built with the framework of human rights as a central focal point.
- **Read pages: 98 - 104**


- Provides insight the ethics of stem cells
- This article relates to our course because it provides information about what stem cells are and the contemporary ethical questions its usage raises when thought of as a biomedical technology to help with disease and ailments.
- **Read pages: 205 - 211**


- Article provides insight on the ethics behind the advertisement of stem cell treatments in direct-to-consumer marketing models.
- **Read pages: 177 - 179**


- This source discusses the framework for ethics and how to approach analyzing ethical dilemmas. This source includes definitions of the basics of bioethics concepts and then applies them to biotech ethics. This is a great source to use when introducing students to the project in which they have to devise their public policy for the regulation of biotech.
- 'Reasoning into Biotech Practice" section good for thought provocation / essay prompts
- **Read pages: 20 - 25**


- Touches on how iPSCs are created and their various uses within science and medicine.
This is a good article in relation to the proposed course because as stated in the title it reviews the social, legal and ethical implications of this biotechnological therapy. The authors also provide questions for follow up

**Read pages:** 1 - 4


- Touches on teaching about gene editing
- Broad ethical dilemmas involved with its implementation

**Read pages:** 61 - 82


- Policies that are currently in place and can be good for referencing


- General article giving an overview of society’s concerns around ethical, safety, bioterrorism and environmental issues. Overall goal of the paper is to describe societal concerns raised by the implementation and provides potential policies for regulation of these policies and their implementation.


- This article is useful to the course because it pertains to social issues as a result of the increasing prevalence of medical biotechnologies in the market that can be used against patients.

**Read pages:** 433 - 454


- Discusses where you draw the line with gametes and debates topics regarding “reproductive tissue engineering”.
- Covers both the use of gametes derived from embryonic and iPSCs

**Read pages:** 1620 - 1632

- Discusses CRISPR as an effective gene editing tool. Has examples such as HIV for explaining the applications of CRISPR in gene editing as well as how it splices genes and can re-insert new ones in a therapeutic manner.


- We can use this source to introduce students to some of the issues that they will have to consider when developing their policies for regulating biotech medicine.
- This source discusses global bioethics and ethical governance of biomedical research collaborations
- Good for convo on implications of international application of bioethics and the barriers of cultural differences / can be related to the diversity of American culture that causes clashes within our own society and how technology developed in the US can be used in offshore industries


- An article describing how genetic screening is performed and the purpose of genetic screening. It focuses quite a bit on newborn screening and the implications of false-negative or false-positive results as well as how knowledge can be both powerful and harmful at the same time.
- **Read pages:** 148 - 164


- Paper reviewing ethical concerns about human iPSCs and that the development of tumors could arise during stem cell therapy.
- **Read Pages:** 1277 - 1284

**Bioethics case studies:**

- [https://www.biotech.iastate.edu/bioethics-case-studies/](https://www.biotech.iastate.edu/bioethics-case-studies/)