

**BIOL 312****Principles of Biotechnology****Fall 2025****Prerequisites** - None**Instructor** - Dr. Engle

Office - 211 Pierce Hall

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Office Hours - MWF 11:00-1:00, T 12:00-2:00

**Credit Hours** - 3

Lecture - 1:00-1:50

Room - 214 or 212 Pierce Hall

Final - Day 3, W Dec. 10, 2:00-4:00

Web page - www.DrEngle.net

**Text** - Smith, J.E. 2009. Biotechnology, 5<sup>th</sup> ed. Cambridge University Press, New York, NY, 266 pp.**Course description** - The basic principles underlying modern molecular biology are presented. Topics include: recombinant DNA technology, gene therapy, monoclonal antibodies, DNA finger printing, and the Human Genome project.**Grading Policy:****Classroom** - This course is not a traditional lecture course, it is primarily a reading comprehension course. While some lecture material will be presented throughout the semester, students will dictate the speed of progress during the semester. Students are required to read the appropriate chapter and come to class with questions. A guide is provided in outline form on the web site (address above) for each chapter. When all the questions are answered an exam on that chapter will be administered. Students are required to read, understand, and evaluate what the author has presented in the textbook and what is discussed in class.**Exams** - Exams will follow the completion of every chapter. The number of exams during the semester depends on the number of chapters we cover. (The last class had twelve exams.) Exams will consist of a few multiple choice questions followed by essay questions which may require a paragraph or a list to answer. The number of points on each exam will vary depending on the length of each chapter with an average of 48 points per exam. Exams are open notebook, but not open textbook. No open textbooks or any reproduction of the textbook is permitted during exams.**Term paper** - A term paper covering a biotechnology topic is required. Topics for the term paper must be approved. Topics are due on **Friday 19 September** and are worth five points. If the topic is not fully approved students may resubmit their topic for full credit within a week of the topics being returned. The final term paper is due **Friday 17 October** and is worth fifty points. Details are explained later in the syllabus.**Grading Scale:**

A=100-92% B+=91-88% B=87-83% C+=82-79% C=78-74% D=73-65% F=64-0%

Grades are NOT curved. Grades are based on the total amount of points accumulated. Other grades (E, W, and I) will be assigned as described in the College Catalog. Policies and procedures contained within are expected to be adhered to.

**Library resources:**

Bradley, J. 2013 Brutes or angels: human possibility in the age of biotechnology QH442 .B72 2013

Buchholz, K. 2010 Concepts in biotechnology: history, science and business TP248.2 .B83 2010

Coltman, P. 2004 Genetic engineering [videorecording] : dreams and nightmares. Part 3, Genetic engineering : applications and issues QH442.G4422001 C.1

Evenson, R.E. 2002 Economic and social issues in ag. biotechnology S494.5 .B563 E26X 2002 EB

Friend, T. 2007 The third domain QR82 .A69 F75 2007

Institute of Medicine 2004 Safety of genetically engineered foods TP248.65 .F66 S245 2004

Jackson, F. 2003 Monoclonal antibodies [videorecording] QR186.85.M6592003 C.1

Miller, H.I. &amp; G. Conko 2004 The Frankenfood myth: how protest and politics threaten the biotech revolution TP248.23.M5562004

Montaigne, F. 2006 Medicine by design: the practice and promise of biomedical engineering R856.M5952006 1

Moody, Glyn. 2004. Digital code of life: how bioinformatics is revolutionizing science, medicine, and business QH441.2.M6642004 1

Thacker, E. 2005 The Global Genome: biotechnology, politics, and culture HD9999.B442T4532005

## Course Outline:

- Chapter 1 The nature of biotechnology
  - Chapter 2 Biomass: a biotechnology substrate?
  - Chapter 4 Bioprocess/fermentation technology
  - Chapter 5 Enzyme technology
  - Chapter 6 Biological fuel generation
  - Chapter 7 Environmental biotechnology
  - Chapter 8 Plant and forest biotechnology
  - Chapter 9 Animal and insect biotechnology
  - Chapter 10 Food and beverage biotechnology
  - Chapter 11 Biotechnology of medicine
  - Chapter 13 Protection of biotechnological inventions
- Additional chapters will be covered if time permits.

## Learning Objectives

- Chapter 1 Define biotechnology, old (traditional) and new.  
List the types of companies involved in biotechnology.  
Appraise the use of microorganisms in biotechnology.
- Chapter 2 Identify sources of biomass.  
Identify the technical considerations considered for choosing raw materials.  
Compare and contrast the ease of use for biotechnology raw materials.
- Chapter 4 Identify and distinguish the stages in a microbial growth curve.  
Argue the considerations in bioreactor design.  
Compare and contrast how oxygen is regulated bioreactors.
- Chapter 5 Recount the use of enzymes in detergents.  
Explain why the cost of enzymes has fallen.  
Justify the use of immobilized enzymes.
- Chapter 6 Define coppiced.  
Summarize how ethanol is made from biomass.  
Summarize how to make biodiesel and critic its advantages.
- Chapter 7 List and describe the different sewage treatment systems.  
Justify using biotechnology to treat contaminated soil.  
Explain how bioleaching is done.
- Chapter 8 Outline how DNA is inserted into plant cells.  
Evaluate why biological control of insect pests is not effective.  
Assess the hurdles to forest biotechnology.
- Chapter 9 Detail the process of somatic cell nuclear transfer.  
Compare, and contrast the three types of vaccine production methods.
- Chapter 10 Evaluate how food and beverage biotechnology differ from pharmaceutical biotechnology  
List foods and beverages that are the result of fermentation.
- Chapter 11 Define orphan drugs and biopharmaceuticals.  
Outline the creation of monoclonal antibodies.  
Explain the process of gene therapy.
- Chapter 13 Detail the process of obtaining a patent.  
Evaluate the benefits and disadvantages of the patent system.

In addition to the above policies and procedures, the instructor reserves the right to alter, augment, or delete from existing policies in order to maintain the proper atmosphere for teaching and learning. All such policy changes will be announced.

## **Paper Requirements**

### Topics:

Topics for the term paper must be approved by turning in your topic on the date due.

The topic choice is worth five points.

The topic should cover either the production process of a biotechnology product or both sides of a controversial topic in biotechnology.

If the topic is not fully approved students may resubmit their topic for full credit within a week of the topics being returned.

### General requirements:

The paper should be from five to six full pages long.

The layout should be 12 point text, double spaced, 1 inch margins, on 8.5 by 11 inch paper.

No Cover page. The first page should include your name in the upper left hand corner followed by a centered title with a blank line, then begin the text.

Each page beyond the first page should be numbered.

Indent paragraphs, and do not use I / we / you.

Please no quotes. Reword and cite your references.

At the end of the paper a separate page should contain the references only.

Staple your final copy together to hand in.

### Reference requirements:

A minimum of seven cited references are required.

At least two of the seven required references may NOT be an internet address.

You must cite your references within your text. Numbering is suggested.

References should be on a separate page and single spaced with a blank line between each reference.

Different journals use different styles for references. Choose a style from one of your references and use it consistently.

The minimum information in a single reference should include: author(s), article title, journal title, year of publication, volume, and page numbers of article.

A good guideline can be found at (<http://www.monroecc.edu/depts/library/cbe.htm>) by the Council of Biology Editors.

### Point distribution: (50 points total)

5 pts. Introduction - Include topic background.

25 pts. Body - This is the major content of the paper. Each point should be at least a paragraph. Be sure to include smooth transitions from point to point. Do not neglect to include safety considerations and public reactions. If a biotechnology controversial topic is covered both sides of the argument must be equally presented. Failure to equally present both sides of an argument will result in points being deducted.

5 pts. Conclusion - Do not include new information here. Evaluate the strength of arguments presented in the body of the paper.

5 pts. References - See above.

10 pts. Overall - Includes grammar, spelling, page numbers on bottom of page, thought development (flow) and were the directions followed.

### Notes:

Don't cite proquest or other database used to find sources, it's like saying "I used a card catalog to find a book"

Each reference should only contain one date and that date should be the date of publication not the date you accessed the article (except for the one allowed internet source).

If you state dates in the paper, use B.C. or A.D., any other dating system is unacceptable.

Wikipedia is not an acceptable source to reference.

NO PLAGIARISM, ask the instructor if you don't know the "rules".

PROOF YOUR PAPER

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## **MAC Policies**

### Weather Delays and Compressed Schedule

In the event of a delayed opening, MAC will follow a compressed schedule. This will provide students with the opportunity to attend all scheduled classes on delay days with each class meeting for a shorter than usual session. For the Compressed Schedule for delay days, go to the following link: <http://www.mtaloy.edu/delays-cancelations>

### Technology and Communication Assistance Statement

All students are expected to regularly log in to the Canvas course website. The site contains the syllabus and assignments, and supplementary materials will be placed there on a regular basis. Furthermore, important announcements will be posted on the site (especially if a class period is canceled due to weather, illness, etc.). For assistance in using Canvas, please contact the Canvas administrator at (Canvas@mtaloy.edu).

College offices and instructors often communicate important information through the MAC email system. Students should check their school email account regularly. For technical or log-in credential questions, please contact the help desk at (helpdesk@mtaloy.edu or 814-886-6502).

### College Academic Integrity Statement

Mount Aloysius College is committed to the academic integrity of the entire community. All share responsibility for maintaining high standards of academic integrity, and no forms of academic dishonesty are tolerated. Forms of academic dishonesty include but are not restricted to: giving or receiving unauthorized assistance on an examination, project, or assignment; using unauthorized forms of assistance such as crib notes or cell phones on an examination; falsification of data or plagiarism (using another person's ideas or words as your own); and lying or falsifying reasons for missing examinations or class.

A student found guilty of lying, cheating, or plagiarism, depending on the nature of the offense and the history of the student, is usually subject to one or both of the following: a grade of zero on the assignment, project, or examination or a grade of F in the course. All cases of lying, cheating, or plagiarism where a punishment is incurred are reported to the Senior Vice President of Academic Affairs, who maintains a record of all offenses. Serial offenders may be subject to suspension or dismissal.

### College Accommodations Statement

Mount Aloysius College is committed to providing reasonable accommodations to students with disabilities. Students with disabilities who wish to request accommodations must contact Ms. Kimberly Washington, MA, Director of Student Success and Persistence, to formally request accommodations and provide supporting documentation. Her office is located in the Library, Room 116, (814) 886-6320. If you receive approval for accommodations, it is important that you stop by the office at the start of the semester so necessary arrangements can be made.

### Attendance Policy

Attendance at all lecture and lab sessions is mandatory. It is your responsibility to notify the instructor **prior** to missing an exam or laboratory and you must have a valid reason. The instructor reserves the right to judge the validity of the excuse. If you miss an exam, you are responsible for taking the exam within one week of your return. There are no makeup labs unless you are able to come to another section during the same week and obtain instructor permission. *Failure of the student to follow the steps outlined above will result in a grade of "0" for the missed exam or lab!*

### Conflict Resolution

Should a student encounter difficulty with course content or other aspects of the course, the first action should be to make an appointment to speak with the instructor. The instructor may suggest resources on campus or other tips to assist student learning. If a student has concerns with their instructor, then the best course of action is to seek out a meeting with the Science and Mathematics Department Chair, Dr. Crystal Goldyn, 814-886-6534, CGoldyn@mtaloy.edu. to discuss the difficulties. If an agreeable decision is not reached, the student should then request a meeting with the Dean, Dr. Chris Lovett, 814-886-6458, CLovett@mtaloy.edu. The Faculty, Department Chairs, and Deans are committed to treating all students with respect and fairness. Additional information is outlined in the academic grievance policy in the College catalog.

### Title IX: Confidentiality and Responsible Employee Statement

Mount Aloysius College faculty are committed to creating a safe learning environment for all members of our community, free from gender and sex-based discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking, in accordance with Title IX of the Education Amendments of 1972.

Please note that the Title IX and Sexual Misconduct Policy designates all faculty members, including teaching assistants, as "Responsible Employees". Under Mount Aloysius College's policy, all "Responsible Employees" must report all disclosures of sex or gender-based discrimination or violence to Mount Aloysius' Title IX Coordinator, Ms. Tonia Gordon, Vice President for People & Mission Integration/Chief Human Resource Officer, tgordon@mtaloy.edu or 814-886-6390. The Title IX Coordinator will reach out to provide resources, support, and information after receiving a report, but community members are not required to respond to such outreach. Reported information will remain private.

If you have (or someone you know has) experienced any form of sex or gender-based discrimination or violence and wish to speak with someone *confidentially*, please contact one of our counselors at counseling@mtaloy.edu or call 814-886-6515. For more information regarding Mount Aloysius College's Title IX procedures, reporting, or support measures, please visit [sites.google.com/mtaloy.edu/titleix/home](https://sites.google.com/mtaloy.edu/titleix/home).

*Disclosures of gender and sex-based discrimination or violence made in relation to an assignment and/or educational prompt will not result in a referral to Mount Aloysius College's Title IX Coordinator unless requested otherwise.*