

Syllabus for MB456/556 Microbial Biotechnology

Credit hours: 3

Time and location: tbd

Prerequisites: At least one of the following. MB302, BI221, BB314, BB331, BB450, BEE362, or ENVE541.

Potential Audience:

Broad scope for majors in MB, BHS, BB, BI, BEE, BRR, various other engineering disciplines, food sciences; all life sciences and engineering graduate programs

Instructor:

Dr. Martin Schuster; Office Nash 422

email: martin.schuster@oregonstate.edu

Office hours tbd or by appointment

Text:

Thieman and Palladino, *Introduction to Biotechnology*, 4th edition, Pearson (2019)

Available as eText via RedShelf (approx. \$35)

Course Content and Dates

The preliminary format below is given as weekly topics. The content and evaluation of student performance is subject to change. For example, the focus could be adjusted according to the target audience.

Week	Content
1	Introduction: Microbes as tools, the Biotechnology Century, the Biotechnology Workforce
2	Microbial genetics, physiology, and gene regulation
3	Recombinant DNA technology and genomics I
4	Recombinant DNA technology and genomics II (incl. CRISPR)
5	Proteins as biotechnology products
6	Systems and synthetic biology
7	Red biotechnology: Applications in medicine (antibiotics, vaccines, microbial diagnostics)
8	White and yellow biotechnology: Applications in industry (chemicals, biofuels) and food production (beer, wine, cheese)
9	Green and grey biotechnology: Applications in agriculture (transgenics, biofertilizers, biopesticides) and environment (wastewater treatment, bioremediation)
10	Biotechnology regulations and ethics, student presentations, course summary

Course Description

Describes and analyzes the use of microorganisms as tools in everyday applications, in genetic engineering, and in medical, industrial, agricultural, and environmental processes. Provides an interdisciplinary introduction to the field, including current topics such as CRISPR, synthetic biology, biofuels and vaccines.

Specific Topics

To include recombinant DNA technology and gene editing (including CRISPR), proteins as products, systems and synthetic biology, food fermentations, antibiotic and vaccine

development, microbial diagnostics, biofuels, biopesticides, bioremediation, the biotechnology workforce, regulations and ethics.

Policies and Learning Resources

The course will be delivered in a lecture format, with ample opportunity for interactions. Lecture handouts will be posted as the course proceeds. These will correspond to most, but not always all, slides used during lectures; spoken lecture material will frequently present more explanations and detail than is shown in handouts. Exam material will draw upon lecture content: there will be **two midterms and a final exam**. Exams will be in-class, open-book, and multiple-choice. Practice tests will be made available before each exam as an example of the test style and level of difficulty. There will also be **three homework assignments** throughout the term; see detailed instructions below.

The **textbook** we will use in this class, Introduction to Biotechnology, is available as hardcopy on Amazon.com or as eText on RedShelf (subscription required). The assigned chapters, as indicated on the first page of the syllabus (to be added), complement the material covered in class. They can help you better understand lecture material and can help you do better on the exams. I recommend reading the assigned book chapters after class to review and reinforce what was covered. **Canvas** will be used for all assignments and exams, and for posting course material such as announcements, handouts, additional reading, practice tests, exam results and answer keys.

The same courtesy rules apply to remote and in-person teaching: Join the class on time, and do not leave early. Turn off your cell phones and do not consume food.

I welcome **questions** during and outside class time. In class, participant audio will be muted initially, but you can “raise your hand” in Zoom using nonverbal feedback functions. Remote office hours are Thursday 2-2:50 pm; additional appointments can be arranged by e-mail or during class. Note the course **prerequisites** and contact me if you lack standard prerequisites but have other experience that makes you confident you are prepared to take the course.

Evaluation of Student Performance

MB456/556: The final grade will be based on the cumulative scores of three exams (Midterm I, 100 points; Midterm II, 100 points; Final Exam, 100 points), and of three homework assignments throughout the term (100 points each). The exams will assess all five learner outcomes described below. The homework assignments will mainly assess learner outcomes #1, 3, and 5. The final grade may be assigned on a curve if the class average is low. There will be no make-up exams (except for a doctor’s note). MB556 only: Presentation of a scientific paper in class and participation in the discussion of these presentations will be worth additional 100 points.

Grading scale:

100-93	A
92.9-90	A-
89.9-87	B+
86.9-83	B
82.9-80	B-
79.9-77	C+
76.9-73	C
72.9-70	C-
69.9-67	D+

66.9-63	D
62.9-60	D-
59.9 and lower	F

Assignments

There are a total of three homework assignments throughout the term, worth 50 points each. The assignments will be available in Canvas at the dates indicated in the syllabus. I will explain each assignment in class. You will work on these assignments individually on your own time. They all entail reading and analyzing a scientific text. Assessment will be in the form of multiple-choice or essay questions in Canvas. Note the due dates on the first page of the syllabus. The late submission policy is to deduct 20% per day past the due date (i.e. minus 4 points up to 24 hrs late, minus 8 points up to 48 hrs late, and so on).

Learner Outcomes for Undergraduate students

At the completion of the course, you should:

1. Acquire and apply specialized language relevant to microbial biotechnology;
2. Describe the various ways that microbes are used as tools in basic research and industrial applications
3. Communicate, explain, and synthesize in writing key aspects of microbial biotechnology
4. Recognize and evaluate currently exciting topics and issues in the field;
5. Describe job perspectives in the field as well as regulatory and ethical considerations;
6. Understand and analyze original scientific literature in microbial biotechnology.

Learner Outcomes for Graduate students

At the completion of the course, you should:

1. Acquire and apply specialized language relevant to microbial biotechnology;
2. Describe the various ways that microbes are used as tools in basic research and industrial applications
3. Communicate, explain, and synthesize in writing key aspects of microbial biotechnology
4. Recognize and evaluate currently exciting topics and issues in the field, and put advancements into a historical context
5. Describe job perspectives in the field as well as regulatory and ethical considerations;
6. Understand and analyze original scientific literature in microbial biotechnology.
7. Critically evaluate, present and explain original scientific literature in the area of microbial biotechnology.

Learner Expectations (advice for doing well in this course)

Intelligently and politely utilize the learning opportunities provided by lectures:

1. Attend all classes; do not arrive late or leave early
2. Lecture notes/handouts are available in *Canvas* about 15 h prior to each lecture. It is your responsibility to study them and have them ready for class. You may write notes on them during the lecture. Content may deviate slightly from actual content covered in class
3. Make notes on anything that is unclear or that you are curious about and seek an answer from me, a classmate or the text
4. Keep up in your understanding and assigned reading; if you fall behind you will not be able to follow lecture material and will rapidly fall still further behind. Do not hesitate to consult me to help you keep up and catch up.
5. You should allocate at least 2 hours of study for each hour lecture throughout the course; don't be tempted to rely on cramming. Homework assignments will require additional time.

University, College and Departmental Policies:**Academic Calendar**

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

Student Conduct Expectations link: <https://beav.es/codeofconduct>

Statement Regarding Students with Disabilities

Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at <http://ds.oregonstate.edu>. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations."

Reach Out for Success

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

Please note: The Department of Microbiology follows the university rules on civility and honesty.

These can be found at <http://oregonstate.edu/studentconduct/regulations/index.php#acdis>
At Oregon State University academic dishonesty is defined by the Oregon Administrative Rules 576-015-0020.1.a-c as: a) "Academic or Scholarly Dishonesty is defined as an act of deception in which a Student seeks to claim credit for the work or effort of another person, or uses unauthorized materials or fabricated information in any academic work or research, either through the Student's own efforts or the efforts of another."

- (i) CHEATING - use or attempted use of unauthorized materials, information or study aids, or an act of deceit by which a Student attempts to misrepresent mastery of academic effort or information. This includes but is not limited to unauthorized copying or collaboration on a test or assignment, using prohibited materials and texts, any misuse of an electronic device, or using any deceptive means to gain academic credit.
- (ii) FABRICATION - falsification or invention of any information including but not limited to falsifying research, inventing or exaggerating data, or listing incorrect or fictitious references.
- (iii) ASSISTING - helping another commit an act of academic dishonesty. This includes but is not limited to paying or bribing someone to acquire a test or assignment, changing someone's grades or academic records, taking a test/doing an assignment for someone else by any means, including misuse of an electronic device. It is a violation of Oregon state law to create and offer to sell part or all of an educational assignment to another person (ORS 165.114).
- (iv) TAMPERING - altering or interfering with evaluation instruments or documents.
- (v) PLAGIARISM - representing the words or ideas of another person or presenting someone else's words, ideas, artistry or data as one's own, or using one's own previously submitted work. Plagiarism includes but is not limited to copying another person's work (including unpublished

material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project and then submitting it as one's own.

“Academic dishonesty cases are handled initially by the academic units (collection of evidence and documentation of incident, meeting with student regarding the situation, determination of responsibility and academic penalty) but will also be referred to the Student Conduct Coordinator for action under the rules.”

Behaviors disruptive to the learning environment will not be tolerated and will be referred to the Office of Student Conduct for disciplinary action.

“The goal of Oregon State University is to provide students with the knowledge, skill and wisdom they need to contribute to society. Our rules are formulated to guarantee each student's freedom to learn and to protect the fundamental rights of others. People must treat each other with dignity and respect in order for scholarship to thrive. Behaviors that are disruptive to teaching and learning will not be tolerated, and will be referred to the Student Conduct Program for disciplinary action. Behaviors that create a hostile, offensive or intimidating environment based on gender, race, ethnicity, color, religion, age, disability, marital status or sexual orientation will be referred to the Affirmative Action Office.”