

COURSE OVERVIEW

General Microbiology

11:680:390

Fall, Spring, Summer

Meeting times TBD

Meeting Location Lecture: Synchronous Lecture Hall Cook/Douglas and Wright Labs Busch

Meeting Location Lab: Food Science 209

CONTACT INFORMATION:

Course Coordinator: Dr. Ines Rauschenbach

Office Location: Lipman Hall, Room 215

Phone: 848-932-5635

Email: inesrau@sebs.rutgers.edu

Office Hours: By Appointment

COURSE WEBSITE, RESOURCES AND MATERIALS:

- **Canvas**
- **Text:** Madigan MT, Bender KS, Buckley DH, Sattley WM, Stahl DA. 2020. Brock Biology of Microorganisms. 16th edition. Pearson, New York, NY.
- **Lab Manual**
 - The lab manual (departmental publication) will be available for free through RUCore.
- **Electronic Notebook**
 - We will be sending you a link to LabArchives. You must sign up before the start of your first lab.

COURSE DESCRIPTION:

This course offers a comprehensive study of the field of microbiology to science majors. The course will give detailed insights into five major themes: Structure and function of microbes (cellular structures, metabolism, and growth); microbial genetics, microbial ecology, microbial diversity (prokaryotes, eukaryotes, viruses) and clinical microbiology (immunity, pathogenicity, epidemiology, control of microbes, and diseases). The course is taught in the synchronous lecture halls on Cook/Douglass and Busch campuses. Students are expected to participate in active learning activities and participate in class discussion to deepen their understanding of the microbial world and apply their knowledge to various concepts.

LEARNING GOALS:

Learning Goals for General Microbiology Lecture:

After completion of the lecture component of the course, successful students will:

1. Demonstrate an understanding of the structural similarities and differences among microbes and the unique structure/function relationships of prokaryotic cells.
2. Comprehend the fundamentals of molecular microbiology.
3. Appreciate the diversity of microorganisms and microbial communities and recognize how microorganisms solve the fundamental problems their environments present.
4. Recognize how the underlying principles of epidemiology of disease and pathogenicity of specific microbes affect human health.

Learning Goals for General Microbiology Laboratory:

After completion of this laboratory, students should be able to:

1. Learn the proper use of a phase contrast microscope to observe microorganisms and report observed characteristics.
2. Practice and apply calculations related to the preparation of media, stock/working solutions, and culture dilutions
3. Apply their knowledge of microbial structure, growth, and metabolism to the identification of an unknown microorganism.
4. Summarize and apply concepts of molecular biology.
5. Demonstrate aseptic technique and perform routine culture handling tasks safely and effectively.
6. Apply scientific method to collect, interpret, and present scientific data in microbiology and related fields.

ASSIGNMENTS/RESPONSIBILITIES, GRADING & ASSESSMENT:

Course Grading:

Grades will be based on lecture material (75%) and laboratory (25%). Lecture grades are based on three (3) class period examinations and a cumulative final (required). Class period exams are 50% multiple choice questions and 50% short answers. The lowest grade of the 3 course exam grades will be dropped. **There are no make ups for any reasons for the three course exams. If you miss an exam, it will be your dropped grade. No exceptions for any circumstances.** Each lecture exam average will be curved to 72% (unless the average is above 72 in which case it will remain unchanged). The final will be composed of 50 multiple choice questions including topics from all four lecture exams. The final is mandatory and the grade will not be dropped. If you miss the final, you will receive a grade of 0. After one exam is dropped percentages for course exams and final: Course exams = 50% (25% each), cumulative final 25%, laboratory grades (25%).

Grading Scale:

| | | | |
|----|-----------|---|----------|
| A | 90 - 100% | C | 70 - 75% |
| B+ | 86 - 89% | D | 60 - 69% |
| B | 80 - 85% | F | 0 - 59% |
| C+ | 76 - 79% | | |

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

Please follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>. Full policies and procedures are at <https://ods.rutgers.edu/>

ABSENCE POLICY

You are expected to attend EVERY lab during the time that you have signed up for. We understand that there are unforeseen circumstances or emergencies that prevent you from attending. If you need to miss lab, you are expected to immediately contact your instructor and TA and provide appropriate documentation for your absence. A very limited number of make ups may be available only for **documented absences**. No exceptions. If you anticipate missing lab due to scheduled interviews or conferences, please let us know right away so she can find you a make-up spot.

COURSE TOPICS:

LECTURE:

| Lec | Topic | Chap |
|------------|---|---------------|
| 1 | Introductions and The Microbial World | 1 |
| 2 | Microbial Cell Structure and Function | 2 |
| 3 | Microbial Metabolism | 3 |
| 4 | Microbial Growth | 5 |
| 5 | Molecular Information Flow and Protein Processing | 4 |
| 6 | Microbial Systems Biology | 9 |
| 7 | Microbial Regulatory Systems | 6 |
| 8 | Genetics of Bacteria and Archaea | 11 |
| 9 | Biotechnology and Synthetic Biology | 12 |
| 10 | Microbial Evolution and Systematics | 13 |
| 11 | Metabolic Diversity of Microorganisms | 14 |
| 12 | Functional Diversity of Bacteria | 15 |
| 13 | Microbial Diversity | 16, 17, 18 |
| 14 | Taking the Measure of Microbial Systems | 19 |
| 15 | Microbial Ecosystems; Microbiology of the Built Environment | 20, 22 |
| 16 | Microbial Symbioses | 23 |
| 17 | Microbial Symbioses with Humans | 24 |
| 18 | Viral Genome Diversity | 10 |
| 19 | Viruses and Their Replication | 8 |
| 20 | Microbial Growth Control; Clinical Microbiology | 5, 28 |
| 21 | Pathogenicity; Immunity and Host Defenses | 25, 26, 27 |
| 22 | Epidemiology | 29 |
| 23 | Person to Person Bacterial and Viral Diseases | 30 |
| 24 | Vectorborne and Soilborne Bacterial and Viral Disease | 31 |
| 25 | Waterborne and Foodborne Bacterial and Viral Diseases | 32 |

LAB:

| Week | Topic |
|-------------|---|
| 1 | - Sign up for LabArchives - Biosafety Assignment - Lab Coat Pick-up-FS209 |
| 2 | - Biosafety Assignment Due (submit prior to lab) - Biosafety Review; Overview of Lab Archives Notebook - Preparation of a Culture Medium - Culturing and Handling of Microorganisms |

| | |
|----|---|
| 3 | - <u>Follow Up</u> : Culturing and Handling of Microorganisms - Isolation of a Pure Culture - Counting Bacterial Populations |
| 4 | - <u>Follow Up</u> : Isolation of a Pure Culture - <u>Follow Up</u> : Counting Bacterial Populations - Controlling Microbial Growth: Experimental Planning |
| 5 | - Microscopy: Protists of Passion Puddle - Controlling Microbial Growth: Lab Work |
| 6 | - Microscopy: Preparing a Wet Mount - Controlling Microbial Growth: Data Collection & Poster |
| 7 | - Midterm Quiz - Controlling Microbial Growth: Poster work - Isolation of Fungi from Air |
| 8 | - <u>Follow Up</u> : Isolation of Fungi from Air; Submit Draft Lab Report - Morphology and Staining of Bacteria - Controlling Microbial Growth: Draft Poster Due; Peer Review |
| 9 | - Microscope Checkout - Microbial Metabolism: Enzymes, Metabolic Capabilities - Controlling Microbial Growth: FINAL Poster Due (end of lab) |
| 10 | - <u>Follow Up</u> : Microbial Metabolism and Unknown Identification - Poster Presentations |
| 11 | - Transformation of <i>Escherichia coli</i> - Isolation of Plasmid DNA - Final Fungi Lab Report Due (submit prior to lab) |
| 12 | - <u>Follow up</u> : Transformation - Digestion of Plasmid DNA (Follow up from Isolation) - Unknown Factsheet Due (submit prior to lab) |
| 13 | - Review - Poster Presentations |
| 14 | - Lab Practical: Techniques and Stations |

FINAL EXAM/PAPER DATE AND TIME

Online Final exam Schedule: <http://finalexams.rutgers.edu/>

ACADEMIC INTEGRITY

The university's policy on Academic Integrity is available at <http://academicintegrity.rutgers.edu/academic-integrity-policy>. The principles of academic integrity require that a student:

- properly acknowledge and cite all use of the ideas, results, or words of others.
- properly acknowledge all contributors to a given piece of work.
- make sure that all work submitted as his or her own in a course or other academic activity is produced without the aid of impermissible materials or impermissible collaboration.
- obtain all data or results by ethical means and report them accurately without suppressing any results inconsistent with his or her interpretation or conclusions.

- treat all other students in an ethical manner, respecting their integrity and right to pursue their educational goals without interference. This requires that a student neither facilitate academic dishonesty by others nor obstruct their academic progress.
- uphold the canons of the ethical or professional code of the profession for which he or she is preparing.

Adherence to these principles is necessary in order to ensure that

- everyone is given proper credit for his or her ideas, words, results, and other scholarly accomplishments.
- all student work is fairly evaluated and no student has an inappropriate advantage over others.
- the academic and ethical development of all students is fostered.
- the reputation of the University for integrity in its teaching, research, and scholarship is maintained and enhanced.

Failure to uphold these principles of academic integrity threatens both the reputation of the University and the value of the degrees awarded to its students. Every member of the University community therefore bears a responsibility for ensuring that the highest standards of academic integrity are upheld.

Just In Case Web App <http://codu.co/cee05e>

Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.

Counseling, ADAP & Psychiatric Services (CAPS)

(848) 932-7884 / 17 Senior Street, New Brunswick, NJ 08901 / www.rhscaps.rutgers.edu/

CAPS is a University mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include: individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.

Violence Prevention & Victim Assistance (VPVA)

(848) 932-1181 / 3 Bartlett Street, New Brunswick, NJ 08901 / www.vpva.rutgers.edu/

The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.

Disability Services

(848) 445-6800 / Lucy Stone Hall, Suite A145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 / <https://ods.rutgers.edu/>

Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: <https://ods.rutgers.edu/students/documentation-guidelines>. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form on the ODS web site at: <https://ods.rutgers.edu/students/registration-form>.

Scarlet Listeners

(732) 247-5555 / <https://rutgers.campuslabs.com/engage/organization/scarletlisteners>

Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.