

COURSE OVERVIEW:

Applied Microbiology

11:680:494

Fall Semester

Tuesday & Friday 9.15 – 10.35; Lab Mondays

CONTACT INFORMATION:

Instructor(s):

Dr. Max Haggbloom

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Dr. Ines Rauschenbach

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Office Hours: By appointment

COURSE DESCRIPTION:

The course examines the principles of applied microbiology and microbial technology providing a perspective of how microbes are used for the benefit of humans and how these technologies have been developed. The course gives a overview on the utilization and application of microbes in different products and processes, and the importance of disease-causing organisms as they relate to these processes and public health. Topics include identification of microorganisms and diagnostics, food and beverage fermentations, microbial metabolites, biofuels, environmental biotechnology. In the lab, students have the opportunity to practice and advance their microbiology skills by collecting, isolating, and characterizing microbes from food, water, and soil samples. The lab will also introduce students to various growth media used in medical and environmental microbiology labs. Students will also have the opportunity to work independently on a semester project isolating unknown microbes and establishing a culture collection for further analysis.

COURSE LEARNING GOALS:

Students are expected to gain a fundamental understanding of how microorganisms are utilized and controlled for the benefit of humankind and develop the laboratory skills needed to study these applications.

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

1. Summarize and explain the roles of microbes in industrial and food processes.
2. Relate their knowledge of traditional microbiological techniques to the utilization and control of microorganisms.
3. Calculate and evaluate microbial growth and death rates.
4. Assess the use of microbes as tools in biotechnology.
5. Describe microbial biochemical pathways and relate them to important industrial processes.

Learning Goals for Applied Microbiology Laboratory:

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

1. Show the ability to efficiently and independently use a phase contrast microscope to observe microorganisms and be able to describe observed characteristics.

2. Relate their knowledge of traditional microbiological techniques to how microorganisms are utilized and controlled.
3. Select appropriate traditional and molecular biological methods to study and characterize microbial isolates.
4. Demonstrate aseptic technique to handle cultures, microbiological media, and environmental samples safely and effectively.
5. Choose various statistical and mathematical methods to critically evaluate data.
6. Devise experiments according to the scientific method and collect, interpret, and present scientific data in microbiology and related fields.

PROGRAM LEARNING OUTCOMES:

1. Graduates will be able to illustrate and describe the biology of microorganisms, focusing on microbial processes and their effects on other organisms and the environment, microbial communities, and biogeochemical cycles.
2. Graduates will be able to apply the scientific method to formulate questions and hypotheses, design experiments, employ appropriate methodology to solve problems in microbiology, and be able to analyze, interpret, and present scientific data in microbiology.

ASSIGNMENTS/RESPONSIBILITIES, GRADING & ASSESSMENT:

Class grade is based on three examinations (75%) and an aggregate laboratory assessment (25%). The examinations have a short and extended answer format with some calculations. Additional exercises and assignments will be assigned during the semester.

The laboratory grading is an aggregate assessment based on reports and quizzes throughout the semester in combination with a practical laboratory examination. The laboratory section of the course is an integral component

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

Students are expected to attend all classes; if you expect to miss one or two classes, please use the University absence reporting website <https://sims.rutgers.edu/ssra/> to indicate the date and reason for your absence. An email is automatically sent to me.

COURSE SCHEDULE:

A detailed course schedule will be provided on the course Canvas site.

LECTURE TOPICS

LAB TOPICS

Topic
Introduction to Lab/Biosafety Microbiological Techniques - Review

Principles of Microscopy Isolation of <i>Actinomyces</i>
Effect of Temperature on Growth
Microbial Death and Control
Evaluation of Commercial Yeast Products
Microbial Food Spoilage Microbes (<i>Salmonella</i> and <i>Escherichia</i>)
Isolation of Probiotics from Yoghurt
Isolation of <i>Azotobacter</i> – The Nitrogen Cycle (Enrichment)
Preparation of a Malt Beverage
Antibiotic Production of <i>Actinomyces</i> and Kirby Bauer Method
Microbial Source Tracking Water Analysis: Microbial Indicators of Fecal Contamination
Collection and characterization of a Culture Collection

FINAL EXAM 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.

STUDENT WELLNESS SERVICES

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.