

Microbial Physiology; 11:682:503; Spring 2025.

In person lectures on Tuesdays and Thursdays from 3:50-5:10 PM. Lectures will occur in the Institute for Food, Nutrition, and Health, Room 101, on the Cook Campus. The address is 61 Dudley Road, New Brunswick, NJ.

LECTURE FORMAT: Two in-person lectures a week. There will be only one lecture on weeks that there is an exam. Midterm exams will be taken during class time. The final exam will occur during finals week at the University's scheduled time. Attendance is required, and absences that are not approved will be reflected in your participation grade.

One synchronous office hour will occur on Wednesdays from 4-5 PM via Zoom. Attendance is not required.

CONTACT INFORMATION:

Instructor(s): Jeffrey M. Boyd, Ph.D.

Office Location: 122 Lipman Hall

Phone: (848) 932-5604

Email: jeffboyd@SEBS.Rutgers.edu

ZOOM LINKS for office hour:

Topic: Microbial Physiology Office Hour

Jeffrey Boyd is inviting you to a scheduled Zoom meeting.

Topic: Microbial Physiology office hours

Time: Jan 22, 2025 04:00 PM Eastern Time (US and Canada)

Every week on Wed, until May 7, 2025, 16 occurrence(s)

Jan 22, 2025 04:00 PM

Jan 29, 2025 04:00 PM

Feb 5, 2025 04:00 PM

Feb 12, 2025 04:00 PM

Feb 19, 2025 04:00 PM

Feb 26, 2025 04:00 PM

Mar 5, 2025 04:00 PM

Mar 12, 2025 04:00 PM

Mar 19, 2025 04:00 PM

Mar 26, 2025 04:00 PM

Apr 2, 2025 04:00 PM

Apr 9, 2025 04:00 PM

Apr 16, 2025 04:00 PM

Apr 23, 2025 04:00 PM

Apr 30, 2025 04:00 PM

May 7, 2025 04:00 PM

Please download and import the following iCalendar (.ics) files to your calendar system.

Weekly:

[https://rutgers.zoom.us/meeting/tJMsduspzgoEtZXRPOBAmgO0xCIXRlwKoYq/ics?icsToken=DKr1EFnO5a8Uzy5OjQAALAAAPqUdM2tNRGb4o3x70Fs6FpaPp6dqKWgEZGyVhCs0OKrRgYruwFNFAKmgYUF0y-X_5NgUnyPib2C86zvjdAwMDAwMQ&meetingMasterEventId=n8Wt1sc6RZybJiMVI5PUyQ](https://rutgers.zoom.us/join/97112493282?pwd=hJlFk8r94V13xVPcPBOJZQf1qdNU1T.1)

Join Zoom Meeting

<https://rutgers.zoom.us/j/97112493282?pwd=hJlFk8r94V13xVPcPBOJZQf1qdNU1T.1>

Join by SIP

97112493282@zoomcrc.com

Meeting ID: 971 1249 3282

Password: 546172

One tap mobile

+13017158592,,97112493282# US (Washington DC)

+13052241968,,97112493282# US

Join By Phone

+1 301 715 8592 US (Washington DC)

+1 305 224 1968 US

+1 309 205 3325 US

+1 312 626 6799 US (Chicago)

+1 646 558 8656 US (New York)

+1 646 931 3860 US

+1 689 278 1000 US

+1 719 359 4580 US

+1 253 205 0468 US

+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

+1 360 209 5623 US

+1 386 347 5053 US

+1 507 473 4847 US

+1 564 217 2000 US

+1 669 444 9171 US

+1 669 900 9128 US (San Jose)

Meeting ID: 971 1249 3282

Find your local number: <https://rutgers.zoom.us/u/abqehzOlud>

If you have any questions, please [contact the Office of Information Technology Help Desk](https://it.rutgers.edu/help-support/)

COURSE WEBSITE, RESOURCES AND MATERIALS:

- <https://rutgers.instructure.com/courses/270615>
- Textbook: The Physiology and Biochemistry and Prokaryotes by David White. Important note: this **textbook is not required** but could be used as a guide if students would like some additional reading material. If used, I would suggest purchasing the third or fourth edition which can be found used for a reasonable price. Lecture notes and readings will be posted on Canvas prior to

individual classes, but lecture notes may be subject to change before the lecture itself. The changes, if any, will not be drastic. The lecture notes and discussions in class will be the basis for evaluation.

COURSE DESCRIPTION:

Microbial Physiology is an intensive course with the goal of integrating biochemistry and genetics to enhance the understanding of the microbial cell and the robust and diverse nature of life. This course is intended to be a capstone class for the microbiology major. It will provide the instructors with the opportunity to re-address the learning goals of the microbiology major and address general scientific misconceptions before student graduation. This course is targeted to “advanced” juniors or seniors majoring in microbiology, biochemistry, biotechnology, and related fields, as well as graduate students.

Microbial physiology is a broad subject area and this course will attempt to provide a balance between the breadth of subjects addressed and the depth at which the subjects are discussed. The course has three overarching topics: 1. central metabolism and energy conservation, 2. macromolecular biogenesis and function and, 3. integration of metabolic events. The introductory lectures will address metabolic functions that are common to most organisms. The lectures will then progress to address metabolic functions that are the “exception to rule” to highlight the diversity of the microbial world. Students will learn about current events in the subject of microbial physiology and modern techniques used to examine metabolism. They will also learn about how the metabolic potential of micro-organisms has been harnessed to address problems facing society. Active teaching techniques, such as think-pair-share questions will be employed throughout the semester to aid in discussions, help improve student retention, assess student learning, and address common scientific misconceptions.

After completing this class, students will have the theoretical background and understanding of microbial physiology that is necessary to conduct microbiological laboratory research or attend professional school. It will also enhance the student’s ability to engage the public on microbiology issues.

ASSIGNMENTS/RESPONSIBILITIES, GRADING & ASSESSMENT:

-Three written examinations (350 points total): Two 100-point exams and one 150-point final exam. One-fourth to one-third of the material covered in the final exam will be new material. I expect all exams to be taken in person. A calculator can be brought to each exam to help solve easy math problems.

-Weekly literature summary (140 points). Every week graduate students are required to read and summarize one or two (related) primary literature articles. A link to the articles is provided on the canvas site. Typically, only one article will be provided, but if the articles are short and on the same subject two articles will be provided. Students are required to read the article and write a succinct report about the article. The report should be between 400 and 800 words in length and include a brief background of the topic and a synopsis of the significance of the topic and findings. Note that the article summaries are a significant portion of your grade so take them seriously.

-Pre-proposal (100 points). An NSF style pre-proposal will be due **Thursday, May 2st**, but it can be turned in any time prior to this date. The topic of the pre-proposal will be: “Exploring the physiology of [my favorite microbe].” The proposal should: 1. provide background on the organism; 2. articulate the key question that you are asking and state your hypotheses; and 3. provide a brief description of your experimental approach. The pre-proposal should be single spaced and between 3-5 pages in length. It is not necessary to elaborate on the materials and methods used.

-Extra credit: Confusing topics questions (1 point per week for a total of 10 points). Students can submit an email to the instructor each week outlining areas of confusion from the topics that were covered in the lectures from the previous week. The instructor will re-address these topics prior to the start of the first lecture of the week, in writing to the student, or as part of the group discussion. These points can also be awarded for participation in the weekly discussions / office hours.

Two exams	200
One final exam	150
Weekly literature summary	140
Pre-proposal	100
In class participation	50

Total 640 points (plus 10 possible extra credit points)

Exam one will be 2/20/25

Exam two will be 4/03/25

Preproposal due 5/2/2025

ACCOMMODATIONS 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:

Topic outline and working schedule:

Please note that every class that has taken this course ends at a different section of the lecture notes. Therefore, the topics and sections are somewhat elastic and new material and subject could be discussed and added at any time. All of the topic below will be covered if time permits.

Topics to be covered in Section one:

What is life? What is a cell? What is physiology? Eukaryotic and Prokaryotic cell structure and function, thermodynamics, oxidation/reduction reactions, chemiosmotic theory, proton motive force, electrochemical energy, respiration, ATP generation, photosynthesis, fermentation

Topics to be covered in Section two:

Central metabolism; glycolysis, tricarboxylic acid (TCA) cycle, Entner-Doudoroff, pentose phosphate pathway, beta-oxidation

Topics to be covered in Section three:

Nitrogen cycle, sulfur cycle, iron oxidation/reduction, acetogenesis, methanogenesis, C1 metabolism, syntrophy

Topics to be covered in Section four:

locomotion, cellular adhesion, cell-to-cell communication, environmental sensing, physiological adaptation

FINAL EXAM/PAPER DATE AND TIME

Final exam schedule can be found here: <https://finals.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

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>.

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.

Scarlet Listeners

(732) 247-5555 / <http://www.scarletlisteners.com/>

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