

PROKARYOTIC CELL: STRUCTURE AND FUNCTION / BACTERIAL PHYSIOLOGY

COURSE NUMBERS: MCB4403 SECTIONS 0024, 3376
MCB6407 SECTIONS 18BF, 24H6, 7143, BPEM

CREDIT HOURS: 3 credits

SEMESTER/YEAR: Fall/2024

CLASS LOCATION: ONLINE

CLASS MEETING TIME(S): Asynchronous. Live attendance is not required. Office hours discussions held on Tuesdays 4:00 -5:30 PM EST throughout the semester through an online platform (zoom). Meetings with the instructor are also available by appointment for those who cannot make office hours.

INSTRUCTOR: Dr. Julie Maupin-Furlow

Office: UF Microbiology and Cell Science Building (#981) Room 1153

Phone: 352-392-4095

E-mail: jmaupin@ufl.edu

OFFICE HOURS: Tuesdays 4:00 – 5:30 PM or by appointment for those who cannot make the scheduled office hours.

COURSE WEBSITE: <http://elearning.ufl.edu>

COURSE COMMUNICATION: The preferred method for communication is by email (jmaupin@ufl.edu). Please feel free to ask questions regarding the course policy and/or material through email and/or zoom meetings. Please note that questions related to the exam material must be asked prior to the scheduled exam time. For emergencies, please email (jmaupin@ufl.edu) or call (352-392-4095).

RECOMMENDED TEXTBOOK: White, D., J. Drummond, C. Fuqua. 2012. *The Physiology and Biochemistry of Prokaryotes*. Fourth Edition. Oxford University Press. New York. ISBN13: 9780195393040, ISBN10: 019539304X. Available through UF MARSTON SCIENCE LIBRARY General Collection QR88.W48 2012.

MATERIALS AND SUPPLIES FEES: None

ADDITIONAL RESOURCES:

Useful websites:

UF exchange <https://www.mail.ufl.edu/>

UF e-learning <https://elearning.ufl.edu/>

UF zoom <https://ufl.zoom.us/>

UF Marston Science Library <https://cms.uflib.ufl.edu/msl/index.aspx>

PubMed <https://www.ncbi.nlm.nih.gov/>

Interlibrary Loan <https://cms.uflib.ufl.edu/accesssupport/interlibraryloan>

Web of Science <https://clarivate.com/webofsciencegroup/solutions/web-of-science/>

(be sure to be connected via VPN for Web of Science)

Endnote web <https://guides.uflib.ufl.edu/EndNote>

UniProt <https://www.uniprot.org/>

Protein Data Bank <https://www.rcsb.org/>

UCSF Chimera <https://www.cgl.ucsf.edu/chimera/>

(to visualize 3D-protein structures)

Phyre2 <http://www.sbg.bio.ic.ac.uk/~phyre2/html/page.cgi?id=index>

(3D homology modeling)

Amino acid browser <http://www.bmrp.wisc.edu/referenc/commonaa.php?ala>

SyntTax <https://archaea.i2bc.paris-saclay.fr/synttax/Default.aspx> (genome synteny)

Muscle <https://www.ebi.ac.uk/Tools/msa/muscle/> (Amino acid sequence alignment)

Research articles/reviews: Scientific research literature is available in pdf format FREE of charge through PubMed, journal websites, the UF library website, or the UF interlibrary loan program listed above. These services are for UF students/faculty so be sure to sign in using the UF VPN connection when using an off-campus computer that is not linked to the UF mainframe. Please note that if access to the article requires use of the UF interlibrary loan program, this service is not instantaneous and may some time – so plan accordingly. Details on obtaining a VPN connection and using these literature search engines can be found in the modules section of this course. If you require assistance in finding a research article and/or searching the research literature, please contact your course instructor at jmaupin@ufl.edu. If you require assistance with the VPN connection, please contact the UF helpdesk (352-392-HELP/4357).

COURSE DESCRIPTION: This course enables students to explore and analyze the structure and physiology of prokaryotic cells, including bacteria and archaea. It covers cell division, growth, stress responses, bioenergetics, and metabolism in depth, while

also examining the assembly and function of crucial cell structures such as cell walls, membranes, and appendages.

PREREQUISITE KNOWLEDGE AND SKILLS:

CHM 2211 and (MCB 3020 or MCB 3023) and (MCB 3020L or MCB 3023L) with minimum grades of C. It is recommended that students have completed or be concurrently enrolled in BCH 4024 or a similar biochemistry course.

COURSE GOALS AND/OR OBJECTIVES:

By the end of this course, students will:

- Become experts in understanding and interpreting the analytical methods used to examine the structure and function of prokaryotic cells.
- Acquire the knowledge and skills necessary to critically evaluate research studies on the physiology and biochemistry of prokaryotes.
- Be able to creatively apply theories of prokaryotic cell structure and function to contemporary issues, such as controlling bacterial pathogens and engineering microorganisms for high-level production of biofuels and renewable chemicals.

HOW THIS COURSE RELATES TO THE STUDENT LEARNING OUTCOMES IN THE MICROBIOLOGY AND CELL SCIENCE PROGRAM:

Students will develop competency in the biological and physical sciences to better understand the principles that govern the natural world. They will acquire new perspectives, methods, and tools to explore both traditional and newly discovered aspects of prokaryotes, including the thermodynamic principles that dictate how these cells live and survive.

INSTRUCTIONAL METHODS:

This course is structured in an online format that will include lectures, discussion sessions, and written projects.

COURSE POLICIES:

ATTENDANCE POLICY:

This course is offered asynchronously, so students do not need to attend online lectures or discussions at specific times. However, students must master the material covered in the lectures and discussions before each quiz or assignment.

QUIZ/EXAM DATES/POLICIES:

All quizzes are CLOSED note. You must independently complete the quiz without assistance from others through Honorlock Online Proctoring according to the quiz policy. Cameras must be used and on during the quizzes. Use of any external information, e-book or textbook is NOT ALLOWED. Cell phones, internet searches, tablets, laptops, smart watches, and any other electronic devices are NOT PERMITTED. Failing to follow these instructions could result in a violation.

ASSIGNMENT POLICY:

All assignments are OPEN note, and the use of computers and other resources is encouraged. However, you must complete the assignments independently, without assistance from others or using their work. If you have any questions or need help, please contact the instructor via email (jmaupin@ufl.edu). Not working independently or solely relying on the instructor's assistance could result in a violation.

MAKE-UP POLICY:

Excused absences from quizzes and assignments are consistent with the UF policies in the catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation. Requests for excused absences (*e.g.*, illness, serious family emergency, military obligations, religious holidays) must be communicated by formal signed documentation to the instructor prior to the missed quiz or assignment. Appropriate documentation MUST be provided for the absence caused by serious illness, accident, jury duty or death in the immediate family. You MUST contact the instructor IN ADVANCE of the missed quiz or assignment. An alternative time for the quiz and/or assignment will only be arranged by the instructor.

COURSE TECHNOLOGY:

For assistance with technology please contact the UF helpdesk at:

<http://helpdesk.ufl.edu>

- (352) 392-HELP - select option 2

ONLINE COURSE EVALUATION:

“Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.”

UF POLICIES:

UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

UNIVERSITY POLICY ON ACADEMIC CONDUCT: UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

CLASS DEMEANOR OR NETIQUETTE: All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions, and chats. It is important to recognize that the online classroom is in fact a classroom, and certain behaviors are expected when you communicate with both your peers and your instructors. These guidelines for online behavior and interaction are known as netiquette. <http://teach.ufl.edu/wp-content/uploads/2012/08/NetiquetteGuideforOnlineCourses.pdf>

UF IN CLASS RECORDING: Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor. A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third-party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

GETTING HELP:

For issues with technical difficulties for Canvas, please contact the UF Help Desk at:

- <http://helpdesk.ufl.edu>
- (352) 392-HELP (4357)
- Walk-in: HUB 132

Any requests for make-ups due to technical issues **MUST** be accompanied by the ticket number received from the Help Desk when the problem was reported to them. The ticket number will document the time and date of the problem. You **MUST** e-mail your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

Other resources are available at <http://www.distance.ufl.edu/getting-help> for:

- Counseling and Wellness resources
- Disability resources
- Resources for handling student concerns and complaints

- Library Help Desk support

(Required) Should you have any complaints with your experience in this course please visit <http://www.distance.ufl.edu/student-complaints> to submit a complaint.

GRADING POLICIES:

METHODS BY WHICH STUDENTS WILL BE EVALUATED AND THEIR GRADE DETERMINED

Quizzes (13 quizzes × 15 points each, lowest quiz score dropped): Thirteen equally weighted multiple-choice quizzes are scheduled throughout the semester (see course schedule for details). Each quiz is worth 15 points and has a 50 min time limit. The quizzes will be administered through the UF Canvas e-learning website. Honorlock will be used to proctor the quiz. The quizzes will focus on the material covered in the online class lectures. Material outside of the class lectures will not be used on the quiz. To perform well on the quiz, students are encouraged to read the textbook chapters noted in parenthesis, print out the lecture notes (in pdf format, online), watch the online-recorded lectures available in the modules section of the course, and study! The lowest quiz score of the semester will be dropped.

Extra Credit (15 points, optional): Students have the option to complete an extra credit assignment (please refer to the course schedule for the specific deadline). This assignment is aimed at enriching your comprehension of the lecture material while also offering an opportunity to acquire valuable skills related to prokaryotic cell structure and function. The primary objective of this extra credit task is to deepen and broaden the understanding and knowledge base of students.

Please ensure that the completed extra credit assignment is uploaded to Canvas, the e-learning course website, no later than 11:59 PM on the specified deadline. It is important to adhere to the guidelines provided in Canvas regarding acceptable file types. Please note that **corrupted files will not be considered**. The deadlines for submission can be found in the "COURSE SCHEDULE" section. It is crucial that students avoid any form of plagiarism when completing this assignment. For detailed information

on plagiarism, please refer to <http://web.uflib.ufl.edu/msl/07b/studentplagiarism.html>. The extra credit assignment and the respective deadline are made available at the beginning of the semester. Since this assignment is optional, no excuses will be accepted for missed deadlines.

Graduate Presentation (30 points): MCB6407 sections only. For the graduate (MCB6407) presentation, students are required to deliver a 10-minute oral report based on a scientific paper from **Appendix A**, which specifically pertains to prokaryotic biochemistry, metabolism, and/or cell physiology. Student presentations should center around the chosen journal article and cover the points outlined in the assignments section on Canvas. To locate the available list of journal articles for selection, please refer to **Appendix A** on the Canvas platform. Research articles and reviews are included in this list.

INFORMATION ON CURRENT UF GRADING POLICIES FOR ASSIGNING GRADE POINTS:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

All MCB4403 sections:

Quiz/Assignment	Points or percentage
Quiz 1	15 points or ~8.3%
Quiz 2	15 points or ~8.3%
Quiz 3	15 points or ~8.3%
Quiz 4	15 points or ~8.3%
Quiz 5	15 points or ~8.3%
Quiz 6	15 points or ~8.3%
Quiz 7	15 points or ~8.3%
Quiz 8	15 points or ~8.3%
Quiz 9	15 points or ~8.3%
Quiz 10	15 points or ~8.3%
Quiz 11	15 points or ~8.3%
Quiz 12	15 points or ~8.3%
Quiz 13	15 points or ~8.3%
Drop lowest quiz	
Extra Credit	(optional - extra 15 points, ~8.3%)
Total points	180 points or 100%

All MCB6407 sections:

Quiz/Assignment	Points or percentage
Quiz 1	15 points or ~7.1%
Quiz 2	15 points or ~7.1%
Quiz 3	15 points or ~7.1%
Quiz 4	15 points or ~7.1%
Quiz 5	15 points or ~7.1%
Quiz 6	15 points or ~7.1%
Quiz 7	15 points or ~7.1%
Quiz 8	15 points or ~7.1%
Quiz 9	15 points or ~7.1%
Quiz 10	15 points or ~7.1%
Quiz 11	15 points or ~7.1%
Quiz 12	15 points or ~7.1%
Quiz 13	15 points or ~7.1%
Drop lowest quiz	
Graduate Presentation	30 points or ~14.3%
Extra Credit	(optional - extra 15 points, ~7.1%)
Total points	210 points or 100%

GRADING SCALE:

95 - 100 %	=	A
90 - 94 %	=	A-
87 - 89 %	=	B+
84 - 86 %	=	B
80 - 83 %	=	B-
77 - 79 %	=	C+
74 - 76 %	=	C
70 - 73 %	=	C-
60 - 69 %	=	D
Less than 60 %	=	E

COURSE SCHEDULE:

CRITICAL DATES:

Quiz Deadlines (routinely due on Mondays with exception of holidays)

Quiz 1 (open 08/29-09/03) R-T* (M holiday)
Quiz 2 (open 09/05-09/09) R-M
Quiz 3 (open 09/12-09/16) R-M
Quiz 4 (open 09/19-09/23) R-M
Quiz 5 (open 09/26-09/30) R-M
Quiz 6 (open 10/03-10/07) R-M
Quiz 7 (open 10/10-10/14) R-M
Quiz 8 (open 10/17-10/21) R-M
Quiz 9 (open 10/24-10/28) R-M
Quiz 10 (open 10/31-11/04) R-M
Quiz 11 (open 11/07-11/12) R-T* (M holiday)
Quiz 12 (open 11/14-11/18) R-M
Quiz 13 (open 12/2-12/09) M-M

Extra Credit Deadline

Extra Credit (due 12/04, optional for all students)

Graduate Presentation Deadline

Graduate Presentation (due 12/04, required for MCB6407 students only)

A WEEKLY SCHEDULE OF TOPICS AND ASSIGNMENTS:

Week 1

R 08/22 Introduction to course, meet the instructor

Week 2

T 08/27 Prokaryotic Cell Evolution, Structure and Function (Ch. 1)

R 08/29 **Quiz 1 (open 08/29-09/03)**

Week 3

M 09/02 Labor Day

T 09/03 Cell Division and Chromosome Replication/Partitioning (Ch. 2-3)

R 09/05 **Quiz 2 (open 09/05-09/09)**

Week 4

T 09/10 Membrane Bioenergetics & Electron Transport (Ch. 4-5)

R 09/12 **Quiz 3 (open 09/12-09/16)**

Week 5

T 09/17 Photosynthesis (Ch. 6)

R 09/19 **Quiz 4 (open 09/19-09/23)**

Week 6

T 09/24 Regulation of Metabolic Pathways (Ch. 7)

R 09/26 **Quiz 5 (open 09/26-09/30)**

Week 7

T 10/01 Central Metabolic Pathways (Ch. 8-9)
R 10/03 **Quiz 6 (open 10/03-10/07)**
Week 8
T 10/08 Metabolism of Lipids, Nucleotides, Amino Acids and Hydrocarbons (Ch. 10)
R 10/10 **Quiz 7 (open 10/10-10/14)**
Week 9
T 10/15 Cell Wall and Capsule Biosynthesis (Ch. 12)
R 10/17 **Quiz 8 (open 10/17-10/21)**
F 10/18 Homecoming
Week 10
T 10/22 Inorganic Metabolism (Ch. 13)
R 10/24 **Quiz 9 (open 10/24-10/28)**
Week 11
T 10/29 C1 Metabolism (Ch. 14)
R 10/31 **Quiz 10 (open 10/31-11/04)**
Week 12
T 11/05 Fermentations (Ch. 15)
R 11/07 **Quiz 11 (open 11/07-11/12)**
Week 13
M 11/11 Veteran's Day
T 11/12 Responses to Environmental Stress/Cues and Chemotaxis (Ch. 16, 19-20)
R 11/14 **Quiz 12 (open 11/14-11/18)**
Week 14
T 11/19 Solute Transport (Ch. 17)
R 11/21 Protein Transport and Secretion (Ch. 18)
Week 15
11/25-29 Thanksgiving Break
Week 15
M 12/02 **Quiz 13 (open 12/2-12/09)**
Week 16
T 12/04 **Extra Credit (due 12/04, optional for all students)**
Graduate Presentation (due 12/04, required for MCB6407 students only)
W 12/05-06 Reading Days
Week 16
M 12/09 **Final deadline for all materials NO EXCEPTIONS –**
Please plan accordingly so assignments and quizzes can be submitted on time.

Disclaimer: This syllabus represents current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity.

COURSE SYLLABUS POLICY: USE OF ARTIFICIAL INTELLIGENCE

1. Ethical Use of AI:

- 1.1. Students are expected to adhere to ethical guidelines when using AI tools and resources. This includes respecting privacy, security, and confidentiality of data, as well as ensuring fairness, transparency, and accountability in their AI applications.
- 1.2. Students should consider the potential biases and implications of their AI models and make efforts to mitigate any discriminatory or harmful effects.
- 1.3. Any use of AI for illegal or unethical purposes is strictly prohibited and may result in academic penalties.

2. Data Collection and Usage:

- 2.1. Students should obtain and use datasets in compliance with applicable legal and ethical standards. They should ensure that they have proper authorization, consent, or rights to use the data.
- 2.2. Students should handle personal or sensitive data responsibly and take appropriate measures to protect the privacy and security of such data.

3. AI Tools and Libraries:

- 3.1. Students are encouraged to explore and utilize a variety of AI tools and libraries, such as TensorFlow, PyTorch, scikit-learn, and others, to enhance their understanding and practical skills.
- 3.2. When using AI tools, students should ensure that they comply with the respective licenses and terms of use set by the tool developers.
- 3.3. Students should properly attribute any code or resources used from external sources, including AI libraries, frameworks, or pre-trained models.

4. Academic Integrity:

- 4.1. Students should uphold academic integrity at all times. Plagiarism, cheating, or any form of dishonesty is strictly prohibited.
- 4.2. If students use existing AI models, algorithms, or code in their projects, they should clearly acknowledge the source and provide appropriate citations.

5. Collaboration:

- 5.1. Collaboration among students is encouraged, as it fosters a collaborative learning environment. However, students should submit their own original work, and any collaborative effort should be appropriately acknowledged.
- 5.2. In group projects, each team member is responsible for contributing to the project's development and should be able to demonstrate their individual understanding of the concepts covered in the course.

6. Responsible AI Deployment:

- 6.1. Students should consider the broader societal impact and implications of AI applications. They should be mindful of the potential consequences, biases, and risks associated with AI deployment.
- 6.2. Throughout the course, students will engage in discussions on responsible AI practices, and they are expected to critically analyze and reflect on the ethical, legal, and social implications of AI.