

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/2022

CLASS LOCATION: ONLINE

CLASS MEETING TIME(S): Asynchronous. Discussions will be held periodically throughout the semester through an online platform (zoom). Live attendance is not required, as the discussions will be recorded to allow flexibility for student schedules. The discussion times are announced on the canvas website and are listed in the course syllabus.

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: By appointment – excluding day prior to exam

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 pertaining to the material related to an exam must be asked at least two days prior to the scheduled exam time. For emergencies, please email (jmaupin@ufl.edu) or call (352-392-4095) me.

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/webofsciencigroup/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 take a few days – 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: Analyzes the cell structure and physiology of bacteria and archaea. Extensive discussion of cell division, growth, stress responses, bioenergetics and metabolism is provided along with understanding the assembly and function of important cell structures (e.g. 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. BCH 4024 should be taken before MCB 4403.

COURSE GOALS AND/OR OBJECTIVES:

By the end of this course, students will

- become an expert on the analytical approaches that are used to examine the structure and function of prokaryotic cells.
- have gained the understanding and skills needed to critically evaluate research studies that address the physiology and biochemistry of prokaryotes.
- be able to creatively apply the theories of prokaryotic cell structure and function to current problems (*e.g.*, 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:

The student will gain competency in the biological and physical sciences to better understand the principles governing the natural world. The students will gain fresh perspectives, methods, and tools for understanding the traditional and the newly discovered world of prokaryotes including the thermodynamic principles that govern how these types of 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:

The course is offered asynchrony; thus, the student does not need to attend an online lecture or discussion at a specific time. However, the material covered in the online lectures and discussions must be mastered prior to each exam.

QUIZ/EXAM DATES/POLICIES:

All exams are CLOSED note. You must independently complete the exam without assistance from others through Honorlock Online Proctoring according to the exam policy. Cameras must be used and on during the exams. Use of any external information, e-book or textbook is NOT ALLOWED. Cell phones, internet, 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. Use of computers or other resources is encouraged. You must complete the assignment without assistance from others; however, you can contact the instructor by email (jmaupin@ufl.edu) if you have any questions or need assistance from the instructor. Failing to follow this instruction to work on your own and rely only upon assistance from the instructor as needed could result in a violation.

MAKE-UP POLICY:

Excused absences from exams and/or assignments are consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation. Excused absences from exams and/or assignments (*e.g.*, illness, serious family emergency, military obligations, religious holidays) must be communicated by formal signed documentation to the instructor prior to the missed exam 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 exam or assignment. An alternative time for the exam and/or assignment will 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

Exams (5 exams × 100 points each): Five equally weighted multiple-choice exams are scheduled throughout the semester (see course schedule for details). Each exam is worth 100 points. The exams are multiple choice/short answer and will be administered through the UF Canvas e-learning website. Honorlock will be used to proctor the exam. The exams will focus on the material covered in the online class lectures. Material outside of the class lectures will not be used on the exams. To perform well on the exam, the student is encouraged to read the textbook chapters noted in parenthesis, print out the lecture notes (in pdf format, online) and watch the online-recorded lectures available in the modules section of the course. The lecture material will be discussed via zoom on ‘Review Material’ days as noted in the class schedule. The zoom meetings will be recorded but will be driven by questions from the students in the class. If you are unable to attend the zoom meetings, please email questions at least one day prior to the meeting time.

Assignments (4 x 100 points each): Four equally weighted assignments related to lecture material are due throughout the semester (see course schedule for details). The goal of these assignments is to enhance your understanding of the lecture material. The assignments are also designed to provide you with the opportunity to learn new skills such as 3D-protein modeling, critically interpreting scientific research articles/reviews, and expressing yourself through scientific writing (not simply answer multiple-choice questions).

Upload the finished assignments onto Canvas (e-learning course website) by no later than 11:59 PM on the date of the deadline. Deadlines are posted in the “COURSE SCHEDULE”. Submit only one attachment per assignment. Only use file types: Word, PDF, HTML, RTF, or plain text. Always include the file extension. **DO NOT PLAGIARIZE** (see <http://web.uflib.ufl.edu/msl/07b/studentplagiarism.html> for details).

Extra Credit (50 points, optional): TO BE ANNOUNCED

Summary Paper (250 points): MCB6407 sections only

The summary paper should be an overview of a topic related to prokaryotic biochemistry, metabolism and/or cell physiology. The paper should be focused on bacteria and/or archaea NOT eukaryotes. Please do not focus on taxonomy. The paper must be typed (double-spaced with 1 inch margins). **The summary paper should be 7 pages of text. The references, title page and any figures or tables do not count toward the 7 page text requirement.** The paper is not a summary of your graduate research findings but is instead a summary of peer-reviewed research articles that have been published in scientific journals.

Please contact me early in the semester to discuss the topic of your summary paper (including potential references you will use for the final paper). This discussion will enable me to confirm that your topic is relevant to the area of prokaryotic cell structure and function and has an adequate amount of information available to write a comprehensive summary.

Please upload the paper through Canvas e-learning by the announced deadline. Note that your submission will be automatically scanned by TurnItIn for plagiarism. If you need assistance in understanding what is considered plagiarism, please ask me.

Please use a citation and reference format that is standard for scientific publications. Endnote web (free to UF students/faculty) is an ideal program to ensure that your citations are properly formatted (<https://guides.uflib.ufl.edu/EndNote>).

INFORMATION ON CURRENT UF GRADING POLICIES FOR ASSIGNING GRADE POINTS:

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

All MCB4403 sections:

Assignment	Points or percentage
Exam 1	100 pts or ~11.1%
Exam 2	100 pts or ~11.1%
Exam 3	100 pts or ~11.1%
Exam 4	100 pts or ~11.1%
Exam 5	100 pts or ~11.1%

Assignment 1	100 pts or ~11.1%
Assignment 2	100 pts or ~11.1%
Assignment 3	100 pts or ~11.1%
Assignment 4	100 pts or ~11.1%
Extra credit	(extra 50 pts)
Total points	900 pts or 100%

All MCB6407 sections:

Assignment	Points or percentage
Exam 1	100 pts or ~8.7%
Exam 2	100 pts or ~8.7%
Exam 3	100 pts or ~8.7%
Exam 4	100 pts or ~8.7%
Exam 5	100 pts or ~8.7%
Assignment 1	100 pts or ~8.7%
Assignment 2	100 pts or ~8.7%
Assignment 3	100 pts or ~8.7%
Assignment 4	100 pts or ~8.7%
Summary paper – research topic related to prokaryotic cell structure and function	250 pts or ~21.7%
Extra credit	(extra 50 pts)
Total points	1150 pts 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:

09/11	Assignment 1
09/22 – 09/25	Exam 1 (Chapters 1-6)
10/02	Assignment 2
10/06 – 10/09	Exam 2 (Chapters 7-9)
10/16	Assignment 3
10/27 – 10/30	Exam 3 (Chapters 10, 12-13)
11/06	Assignment 4
11/17 – 11/20	Exam 4 (Chapters 14-15, 17-18)
12/01 – 12/04	Exam 5 (Chapters 16, 19, 20)
12/07	Assignment - Extra Credit (optional)
12/07	Summary Paper (MCB6407 sections only)

A WEEKLY SCHEDULE OF TOPICS AND ASSIGNMENTS:

Week 1

08/25 Introduction to course, meet the instructor

Week 2

08/30 Prokaryotic Cell Evolution, Structure and Function (Ch. 1)

09/01 **Labor Day - Holiday**

Week 3

09/06 Cell Division and Chromosome Replication/Partitioning (Ch. 2-3)

09/08 Membrane Bioenergetics and Electron Transport (Ch. 4-5)

09/11 **Assignment 1 – due**

Week 4

09/13 Photosynthesis (Ch. 6)

09/15 [continued]

Week 5

09/20 Review material

09/22 to 09/25 - Exam 1 (Chapters 1-6)

Week 6

09/27 Regulation of Metabolic Pathways (Ch. 7)

09/29 Central Metabolic Pathways (Ch. 8-9)

10/02 - **Assignment 2 – due**

Week 7

10/05 Review material

10/07 **Homecoming**

Holiday (recommend getting organized and taking the exam on 10/06)

10/06 to 10/09 - Exam 2 (Chapters 7-9)

Week 8

10/11 Metabolism of Lipids, Nucleotides, Amino Acids and Hydrocarbons (Ch. 10)

10/13 Cell Wall and Capsule Biosynthesis (Ch. 12)

10/16 Assignment 3 – due

Week 9

10/18 Inorganic Metabolism (Ch. 13)

10/20 [continued]

Week 10

10/25 Review material

10/27 -10/30 - Exam 3 (Ch. 10, 12-13)

Week 11

11/01 C1 Metabolism (Ch. 14)

11/03 Fermentations (Ch. 15)

11/06 Assignment 4 – due

Week 12

11/08 Solute Transport (Ch. 17)

11/10 Protein Transport and Secretion (Ch. 18)

Week 13

11/15 Review material

11/17 to 11/20 - Exam 4 (Chapters 14-15 and 17-18)

Week 14

11/22 Responses to Environmental Stress/Cues and Chemotaxis (Ch. 16, 19-20)

11/23-26 Thanksgiving holiday

Week 15

11/30 Review material

12/01 to 12/04 - Exam 5 (Chapters 16, 19-20)

Week 16

12/07 Last class

Summary Paper Due (graduate level sections)

Extra credit (optional) - due

INFORMATION ON ZOOM MEETINGS:

Zoom meetings will be announced periodically throughout the course to meet the instructor and review the material. The zoom meetings will be recorded for those who cannot attend. If you cannot attend, please feel free to ask questions via email; however, all emailed questions must be sent at least one day prior to the zoom meeting. The zoom meeting is intended only for students registered for the course. The recordings of the zoom meetings will be linked in the modules section.

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

opportunity. Such changes, communicated clearly, are not unusual and should be expected.