Bacterial Physiology, Antibiotics, and Genetics

GMS 6108

3 credit hours

online

course director:

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Office Hours: Generally MWF 9:00-5:00 Eastern time by email, but email may be answered at any time at the discretion of the faculty member.

Course Website: https://ufl.instructure.com

Course Communications: Communication from the faculty to the students will be made via the Announcements section of the Canvas web page. Students are expected to review this section once per day to keep informed of communications. Announcements automatically send an email to the UF Gatorlink email address of enrolled students, so students should also check their UF Gatorlink email once per day.

Recommended Texts (both are available as e-texts and are HIGHLY recommended):

- Snyder and Champness Molecular Genetics of Bacteria, 5th Edition, Henkin and Peters., ASM Press, 2020.
- Antibiotics: challenges, mechanisms, opportunities. Christopher T. Walsh and Timothy A. Wencewicz. ASM Press, 2016.

Additional Resources: A good microbiology textbook, such as the required textbook from GMS 6121 (Schaechter's Mechanisms of Microbial Diseases. 6th ed., Lippincott William & Wilkins), would be helpful. There are also excellent online resources to help fill in gaps.

Course Description: This course is a compendium of three one-credit courses that are often taught in succession over a semester: GMS 6038 Bacterial Genetics and Physiology, GMS 6153 – Advanced Bacterial Genetics, and 6169 Antimicrobial Strategies.

Prerequisite Knowledge and Skills: This course is designed to follow GMS 6121 Infectious Diseases, which includes a very brief introduction to bacterial structure, physiology, and genetics aimed at students who have not taken formal microbiology courses. GMS 6108 builds upon that

introduction. **Therefore, this course is also appropriate for students who either majored in microbiology or took a comprehensive undergraduate microbiology course. The introductory lecture materials from GMS 6121 are provided online so that students can bring themselves up to speed before beginning this course. Finally, an online quiz as a preliminary assignment will ensure that students comprehend the prerequisite knowledge, even those who took GMS 6121. If a prospective student has concerns about taking GMS 6108, they should contact the course director.**

Course Goals and/or Objectives: By the end of this course, students will be able to:

- describe differences in cell structure among different classes of bacteria
- relate how cell structure and composition affect the biology and genetics of the bacteria
- describe in detail the process of gene expression from transcription to translation to secretion and identify the genetic elements involved with these processes
- relate chromosomal DNA replication to different models of plasmid DNA replication and use this information to explain the biology and use of representative plasmids
- describe the life cycles and replication mechanisms of representative bacteriophages
- creatively use plasmids and phages in manipulation of bacterial genomes
- describe the regulation of transcription from the most basic paradigms to more complicated models of regulation
- use models of transcriptional regulation in solving problems of gene expression
- understand history of antibiotics
- describe mechanisms of antibiotic action
- explain acquired and intrinsic resistance mechanisms
- explain the concept of ancient resistance
- describe the use of phage as non-conventional therapeutic agent

Teaching Philosophy: My teaching philosophy for graduate students is that we are a team moving forward in education. We will do our best to teach the relevant material in the most effective manner. We expect students to participate in their own education by studying assigned materials, completing assignments, and asking for help in a timely manner having attempted to seek answers on their own using available resources.

Instructional Methods: Recorded lectures in the form or narrated PowerPoints will be posted along with a brief homework/quiz to enforce timely viewing and study of the lecture.

Course Policies:

Attendance Policy: Attendance constitutes viewing lecture videos and completing homework/quizzes. If a student cannot participate online in the set times, they should communicate the issues with the relevant faculty member. Course attendance policies are in accordance with UF policy on attendance: (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx).

Homework/Quiz/Exam Policy:

Homework/Quizzes: Online homework and quizzes are aimed at encouraging timely mastery of assigned course material. They are open book, open note.

Every online lecture will have a 5 question multiple choice homework/quiz with a specific due date and time. Usually that will be 11:59 pm on the Sunday following the scheduled lecture. The homework deadline may be moved up for the week of an exam. Homework assignments, along with all other course materials, will be posted in the Modules section of the course. That is the single official site for course content and assignments. Although these materials may appear in the Calendar and Assignments pages, those are not the official assignment pages for content.

Exams: There are three exams – one for each five-week section of the course. The exams are closed book, closed note, multiple choice, with questions similar to the quizzes. **Exams will be administered via Honorlock. Students are expected to be familiar with the procedures for having all of the necessary hardware and software to take the exams via Honorlock. There is a 3 day window for scheduling each exam.**

Make-up Policy: If a student misses an assignment such as a homework or quiz, it may be made up according to University of Florida policy for allowable excused absences (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx). **If you experience life issues that hinder your ability to take an exam, contact the course director for possible accommodations. It is better to see help ahead of time that after you experienced an problem on an exam. There is no make-up or extra credit.**

Assignment Policy: There are assigned homework and quizzes designed to help students keep up with studying and to ensure that they have an understanding of the material. Unless a student has a university-allowed reason for missing an assignment (see above), a grade penalty of at least 10% will be levied against late assignments.

Grading Policies:

The final grade will be calculated as follows:

Exams 60% (20% each)

Homework/quizzes 40%

Grading Scale: The default grading scale for the class is: A ≥90, A- 87-89.9, B+ 84-86.9, B 80-83.9, B- 77-79.9, C+ 74-76.9, C 70-73.99, C- 67-69.9, D+ 64-66.9, D 60-63.99, D- 57-59.9, E ≤56.9. This scale may be shifted downward, but it will never be shifted upwards. See the UF policy on grades at: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

UF Policies:

University Policy on Accommodating Students with Disabilities: Students requesting accommodation for disabilities must first register with the Dean of Students Office (http://www.dso.ufl.edu/drc/). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

University Policy on Academic Misconduct: Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at http://www.dso.ufl.edu/students.php.

Netiquette: Communication Courtesy: All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions and chats. http://teach.ufl.edu/docs/NetiquetteGuideforOnlineCourses.pdf

COURSE/FACULTY 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/."

STUDENT RECORDING OF LECTURES

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 E-learning in Sakai, please contact the UF Help Desk at:

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- https://lss.at.ufl.edu/help.shtml

Any requests for make-ups due to technical issues MUST be accompanied by the ticket number received from LSS 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

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

Course Schedule (see modules for detailed schedule):

Weeks 1-5 Bacterial Genetics and Physiology

- Week 1 - Review structure, physiology, general genetics, antibiotics and resistance
- Week 2 - Transcription, translation, secretion, DNA replication
- Week 3 – Genetic exchange, mutagenesis
- Week 4 – Plasmids and bacteriophages
- Week 5 – Regulation of Expression and exam 1

Weeks 6-10 Advanced Bacterial Genetics

- Week 6 - Gene cloning and functional analysis of genes
- Week 7 - Mechanisms of gene regulation
- Week 8 - Global regulatory mechanisms
- Week 9 - Molecular genetic analysis and biotechnology
- Week 10 - Genomic approaches to bacterial genetics and exam 3

Weeks 11-15

- Week 11 - Antibiotic discovery, classification, and mode of action
- Week 12 - Antibiotic target identification
- Week 13 - Antibiotic resistance: mechanisms, regulation, and acquisition
- Week 14 - Antimicrobial resistance is ancient
- Week 15 - Phage therapy: opportunities and challenges and exam 2