

Welcome to BIOL 669: Pathogenic Microbiology (3 credits)

Spring 2023 (Thursdays, 4:30 pm - 7:10 pm)

Synchronous Online Lectures:

<https://us02web.zoom.us/j/5847654684?pwd=dU9jOXpjSzVYUExdmMwdjJ2RkRSUT09>

Meeting ID: 584 765 4684; Passcode: q4rUDb

All exams will be administered in person in Discovery Hall, room 153W.

IMPORTANT: Per recommended prerequisite for this course, first year MS students are strongly encouraged to first pass either BIOL 682 or BIOL 744 with grade of B or higher before taking this course.

This graduate level course will address the molecular mechanisms by which bacterial and viral pathogens cause human disease. Basic principles of pathogenesis will be first presented before conducting a survey of several infections that represent medically important and relevant diseases. The molecular interactions between hosts and their infecting microbes will be thoroughly discussed.

Main Course Objectives:

1. Develop a solid understanding of the complex nature of virulence with respect to the multi-faceted interactions with the host and the host immune response mechanisms.
2. Learn the strategies used by pathogens to cause manifestation of human disease
3. Learn some of the strategies for treatment and prevention of human infection (e.g., vaccines, antibiotics)
4. Relate objectives 1-3 above to contemporary research literature in the field of microbial pathogenesis

Professor:	Ramin M. Hakami, Ph.D. E-mail: rhakami@gmu.edu ; Phone: 703-993-7084. <u>Contact by e-mail is preferred.</u>
Office Hours:	Every Friday from 3:00 – 5:00 pm; please be sure to e-mail at least a day ahead to set up/confirm a meeting. <u>It will be conducted by Zoom unless an in-person meeting is required.</u>
Course Website:	Login at http://mymason.gmu.edu to access Blackboard for course-related materials. Please contact support center for Blackboard assistance (Phone: x3-8870, E-mail: courses@gmu.edu)
Course Lectures:	Please go to Dr. Hakami's personal meeting room in Zoom: https://us02web.zoom.us/j/5847654684?pwd=dU9jOXpjSzVYUExdmMwdjJ2RkRSUT09

There are a total of 2 required exams for this course: a midterm exam, and a final exam. Other graded materials will include oral presentation of a journal article, and discussion participation. There are absolutely no make-up exams during the semester for **any** reason. If you miss the midterm exam and have an appropriate **official verifiable document** for the excuse, then the weight of the midterm exam will be given to your final exam (i.e., your final exam will account for 70% of your course grade). Absence from the final exam due to illness will be excused for which you must provide an **official verifiable document**. However, other causes for missing the final exam must be approved by the student's academic Dean or director. If absence from the final exam is unexcused, the grade for the course is entered as "F". If you miss the final exam with a valid excuse, then the weight of your final exam will be added to your midterm exam.

Grade Distribution and Policy:	
Midterm exam	35%
Final exam	35%
Class presentation	25%
Discussion participation	5%

If it turns out to be to the advantage of the class, test grades will be curved based on class average

Final Grades:	
87-100	A
84-86	A-
81-83	B+
78-80	B
75-77	B-
72-74	C

SCHEDULE OF WEEKLY LECTURE TOPICS:

Date	Week	Topic	Class Presentations
January 26	1	Germ Theory, Disease Terminology, and General Characteristics of Pathogens	
February 2	2	Molecular Approaches to Study Pathogenicity	
February 9	3	Microbial Attachment to Host Cell and Entry	
February 16	4	Innate Immune Response	
February 23	5	Adaptive Immune Response	
March 2	6	Microbial Evasion of Host Immunity	
March 9	7	MIDTERM EXAM (closed book)	
March 16	8	No Class (Spring Recess)	
March 23	9	COVID-19 (Open Class Discussion)	1
March 30	10	Pathogenic Host Cell Death Mechanisms	2
April 6	11	<i>Yersinia pestis</i> and other <i>Yersinia</i> spp.	3
April 13	12	<i>Staphylococcus aureus</i> Infections	4
April 20	13	<i>Mycobacterium tuberculosis</i>	5
April 27	14	<i>Bacillus anthracis</i> and other <i>Bacillus</i> spp.	
May 4	15	Vaccines and Antimicrobials	
May 11	16	FINAL EXAM (closed book)	

GRADED MATERIALS:

1. Exams (70% of grade)

The exam question format will be a combination of multiple-choice questions and questions for which you must provide descriptive answers. The exams will include questions that are specific and require your in-depth understanding of important specific concepts and details or names that will be presented in the lectures, as it is an important means of testing your sufficient mastery of the course materials. I will provide you with sample test questions before the mid-term exam, in order to provide you with a clear idea of the type of questions that will be on the exams.

There are no make-up exams under any circumstances; however, if you have a valid excuse to miss the midterm exam (must provide appropriate official and verifiable documentation), the percentage of total grade assigned to that exam will be applied to your final exam (i.e., your final exam will account for 70% of your course grade). Absence from the final exam due to illness will be excused for which you must provide an appropriate official verifiable document. However, other causes for missing the final exam must be approved by the student's academic dean or director. If absence from the final exam is unexcused, the grade for the course is entered as F. Only the lecture materials (not the class presentations or discussions) will be tested on the exams. The midterm exam will cover lecture materials from week 1 through week 6. The final exam is NOT cumulative and will cover lecture materials from week 10 through week 15. Please note that week 9 is an open class discussion on COVID-19 and will not be included on any exam. However, participation in the discussion for this week 9 class influences your final grade as described below in the "Discussion Participation" section.

Please go to Discovery Hall, room 153W, to take the exams.

2. Journal Article Presentations (25% of grade)

Students will be assigned into groups of two per team to make a 35-minute presentation of a full-length original research article (i.e., NOT a short communication or a short research paper) that is directly on a topic assigned by me 6 weeks before the presentation date. "Review" articles are NOT accepted for class presentation as they provide a review/summary of majority of the work that other research groups have published in a specific research area but are not themselves original research papers. **The work of presenting the journal article must be divided equally between the two members of each team. In other words, each team member must present half of the data figures, and the rest of the presentation (such as introduction, or conclusions, etc.) should be divided equally between the two members of the team so that one person is not carrying the weight of the presentation disproportionately. Furthermore, each team member must present their own separate critiques of the data figures that they have presented, although in addition to that it is fine to also include a common set of critiques that both members have come up with together. Also, please note that reading directly off the slides or written notes is not allowed and significant points will be deducted if a presenter does that. Each team member will be graded on the quality of their own presentation.**

I will post the topic assignment on Blackboard. All topics are directly related to the course, and have been selected in such a way as to complement the lecture materials.

I must receive by e-mail your selected article in PDF format no later than Monday morning of the week in which you are presenting. I will then post it on Blackboard so that everyone can access it and have time to read it before class. If you have any doubts as to whether you have selected the right type of article for your topic, please consult me and I would be more than happy to provide guidance.

For this assignment, you must select a full-length research article that is published no earlier than 2020 in a journal with an impact factor of >3 . Some examples of strong journals that satisfy this requirement are *Cell*, *Nature*, *Nature Immunology*, *Nature Cell Biology*, *Nature Genetics*, *Science*, *PLoS Pathogens*, *Proceedings of the National Academy of Sciences USA* (PNAS), *Scientific Reports*, *Molecular Cell*, *EMBO Journal*, *Infection and Immunity*, *Frontiers in Microbiology*, *Journal of Cell Biology*, *PLoS*

Genetics, Journal of Virology, BBA General Subjects, Journal of Biological Chemistry, Nucleic Acid Research, Journal of Bacteriology, The Journal of Infectious Diseases, Emerging Infectious Diseases.

To ensure receiving maximum points for your presentation, in addition to observing the above requirements the following aspects related to the presentation itself must also be followed:

- A. In addition to presenting and describing the data figures and findings of the research article, you must also provide your own critical analysis of the data. In other words, you must discuss your own analysis of the strengths and weaknesses of the article; for example, whether the methodologies used are appropriate and adequate, if proper and adequate controls have been used for the experiments and if additional experiments are warranted to strengthen a particular claim, whether you think the conclusions of the article are appropriate and match the findings, what future questions should be addressed, etc. You must be specific. Also, you must provide satisfactory reasons for your criticisms; it is not sufficient to state a criticism without explaining the reasons behind it.
- B. As part of your presentation, you must also clearly explain the main techniques that have been used in the research article for generating the results. Obviously, this requires taking time to educate yourself about the main techniques in the article if you are not already familiar with them; if you find that you need help with this, please let me know and I would be happy to guide you. While it is not necessary to know or present the minute details of any given technique, you should nevertheless have sufficient understanding of the essentials of how the technique works and what type of information it provides so that you can clearly explain it to the class or if asked by the audience. For most techniques, use of graphics/drawings and/or images to explain the essential concepts to the audience can be very helpful.

Late Journal Article Presentation: All journal article assignments must be presented on the assigned due dates. If you miss your assigned presentation date and have written documentation that shows a valid excuse for your absence (e.g., a doctor's note) either you will be given a make-up date if one is available, or the percentage of the total grade assigned for the class presentation (25%) will be instead distributed equally towards the two exams (i.e., the midterm exam and the final exam each will count towards 47.5% of your course grade). You will not receive any credit for this part if you cannot provide a valid documented excuse for your absence.

3. Discussion Participation (5% of grade)

To get credit for this part of the grade, you must engage in the following class discussions: 1) Open class discussion on COVID-19 scheduled for week 9 class; 2) Discussions that follow each journal article presentation, by taking the initiative to ask relevant scientific questions, or provide ideas and analytical thoughts, about the presented findings and conclusions. Credit will be given for thoughtful questions and comments on the experimental procedures, the data presented, and the conclusions, but not on more "trivial" aspects such as figure resolution/quality, etc. You must have a regular engagement in these discussions in order to ensure receiving full credit. **Specifically, to receive full participation credit, you must either ask a question of the type described above, or engage in the discussion surrounding a question that someone else has asked, for at least 80% of the presentations (including COVID-19 discussion) during the semester. This excludes your own assigned presentation. The percentage of total grade assigned to discussion participation (5%) is distributed equally among the total number of class discussions in which you need to participate during the semester in order to reach the 80% threshold described above.** So, for example, if there happens to be a total of 5 class discussion opportunities during the semester (i.e., the COVID-19 discussion plus 4 class presentations not counting your own), then in the course of the semester you need to participate for a total of at least 4 times during these discussion opportunities by providing thoughtful and pertinent questions or comments (i.e., at least one question or comment for 4 of the 5 discussion opportunities). In this example, each engagement will count for 1.25% of the total 5% credit, based on equal distribution of the 5% grade credit between 4 engagements.

ACADEMIC INTEGRITY

GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone else's work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. When you take any test (quiz or exam), you will not cheat. Another aspect of academic integrity is the free play of ideas. Class discussions are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas and perspectives. When in doubt (of any kind), please ask for guidance and clarification.

SUGGESTED READINGS:

1. **Cellular Microbiology; 2nd Edition.**
Editors: P. Cossart, P. Boquet, S. Normark, R. Rappuoli
Publisher: American Society of Microbiology, 2005
2. Bacterial Pathogenesis: A Molecular Approach; 3rd Edition
Authors: B. A. Wilson, A. A. Salyers, D. D. Whitt, M. E. Winkler
Publisher: ASM Press, 2010
3. Brock Biology of Microorganisms; 14th Edition
Authors: M. T. Madigan, J. M. Martinko, K. S. Bender, D. H. Buckley, D. A. Stahl, T. Brock
Publisher: Pearson, 2014
4. Principles of Bacterial Pathogenesis; 1st edition
Editor: E. A. Groisman
Publisher: Academic Press, 2001
5. Bacterial Disease Mechanisms: An Introduction to Cellular Microbiology; 1st Edition
Authors: M. Wilson, R. McNab, B. Henderson
Publisher: Cambridge University Press, 2002
6. Reading Primary Literature: A Practical Guide to Evaluating Research Articles in Biology.
Author: C. M. Gillen.
Publisher: Pearson, 2007

Additional suggestions:

Dixon, B. (1994) Power Unseen: How Microbes Rule the World
Postgate, J.R. 4th Ed (1999) Microbes and Man
Prescott, L.M. et al. (2001) Microbiology
Atlas, R.M. & Bartha, R. 4th Ed (1998) Microbial Ecology: Fundamentals & application

SOME IMPORTANT DATES:

January 30	Last day to add class
February 6	Last day to drop with 100% tuition refund
February 13	Last day to drop with 50% tuition refund
Feb. 14-Feb. 27	Unrestricted Withdrawal Period: 100% Tuition Liability
March 9	Midterm exam
May 11	Final exam

Each student must verify the accuracy of their enrollment before the end of add/drop period. Students not properly enrolled by the deadlines will not be granted any schedule adjustments by the Department or the Dean's Office.

GMU EMAIL ACCOUNTS

Students must use their Mason email accounts to receive important University information, including messages related to this class. See <http://masonlive.gmu.edu> for more information.

OFFICE OF DISABILITY SERVICES

If you are a student with a disability and you need academic accommodations, please see me and also contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. <http://ods.gmu.edu>

OTHER USEFUL CAMPUS RESOURCES

WRITING CENTER: A114 Robinson Hall; (703) 993-1200; <http://writingcenter.gmu.edu>

UNIVERSITY LIBRARIES “Ask a Librarian” <http://library.gmu.edu/ask>

COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS): (703) 993-2380; <http://caps.gmu.edu>

UNIVERSITY POLICIES

The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at <http://universitypolicy.gmu.edu/>. All members of the university community are responsible for knowing and following established policies.

QUESTIONS? PLEASE ASK!