

# Welcome to BIOL 669: Pathogenic Microbiology (3 credits)

Fall 2024 (Thursdays, 4:30 pm - 7:10 pm)

## \*IMPORTANT INFORMATION\*:

A) All course lectures are pre-recorded and will be on Blackboard for your access. However, all exams will be administered in person in Science & Tech campus, Colgan Hall, room 302 (exam dates: 10/10/24 & 12/12/24).

B) We will meet in person for the first class on 08/29/24 for introduction and to go over the syllabus in Science & Tech campus, Colgan Hall, room 302. Also, if the class indicates a need, we have the option of meeting in person on 10/03/24 to allow for further in-person interactions.

C) We will meet by Zoom for the class presentations on 11/14/24 and 11/21/24, and for the open class discussion on "COVID-19 and Beyond" on 12/05/24 (please see schedule table on next page)

Zoom meetings link, and meeting ID and passcode:

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

Meeting ID: 584 765 4684; Passcode: q4rUDb

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

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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. It will be conducted by Zoom unless an in-person meeting is required.
Course Website:	Login at <a href="http://mymason.gmu.edu">http://mymason.gmu.edu</a> to access Blackboard for course-related materials. Please contact support center for Blackboard assistance (Phone: x3-8870, E-mail: <a href="mailto:courses@gmu.edu">courses@gmu.edu</a> )

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.

<u>Grade Distribution and Policy:</u>	
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:**

<b>Date</b>	<b>Week</b>	<b>Topic</b>	<b>Class Presentations</b>
August 29	1	Germ Theory, Disease Terminology, and General Characteristics of Pathogens	
	2	Molecular Approaches to Study Pathogenicity	
	3	Microbial Attachment to Host Cell and Entry	
	4	Innate Immune Response	
	5	Adaptive Immune Response	
October 3 (Optional Classroom Use; Colgan, #302)	6	Microbial Evasion of Host Immunity	
October 10	7	<b>MIDTERM EXAM (closed book)</b>	
	8	Pathogenic Host Cell Death Mechanisms	
	9	<i>Yersinia pestis</i> and other <i>Yersinia</i> spp.	
	10	<i>Staphylococcus aureus</i> Infections	
	11	<i>Mycobacterium tuberculosis</i>	
	11	<i>Bacillus anthracis</i> and other <i>Bacillus</i> spp	1, 2
	12	Vaccines and Antimicrobials	3, 4, 5
November 28	12	Thanksgiving Holiday	
December 5 (Optional Classroom Use; Colgan #302)	14	COVID-19 and Beyond (Open Class Discussion)	
December 12	15	<b>FINAL EXAM (closed book)</b>	

## **GRADED MATERIALS:**

### **1. Exams (70% of grade)**

- A. 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 is information in some lecture slides that is purely historical in nature; there will NOT be any questions on the exams on purely historical information and they are simply for making you aware of the historical context for some of the scientific discoveries/progress that is discussed.
- B. There will be a hybrid meeting (i.e., you can attend either in person or by Zoom) on 02/22/24 (Katherine Johnson Hall in the Manassas campus, room 257). This is to allow additional opportunity to ask questions about lecture materials and also in case the class presentations team members need to connect more.
- C. 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 that carries appropriate signature), 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 that carries appropriate signature. 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 8 through week 13. Please note that week 15 is an open class discussion on COVID-19 and beyond, and will not be included on any exam. However, participation in the discussion for this week 15 class influences your final grade as described below in the “Discussion Participation” section.

Please go to Science & Tech campus, Colgan Hall, room 302, 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 8 weeks before the presentation date. The team members can connect with each other through a “Communication between Classmates” forum that I will set up in Blackboard, under “Discussion Board”. Please note that “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 also 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 2021 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.
- C. When presenting, in addition to having your microphone on, you must also turn on your video. Furthermore, for your presentation, you should not read directly off previously written text, or read word for word directly from the written text on your slides. As part of developing and demonstrating good presentation skills, you must be able to describe what you are presenting to the audience in your own words and without having to read off previously written text.
- D. When using any technical terminology, such as the name of a particular technique or procedure, or the name or descriptive phrase for a process, you need to provide at least a brief explanation of what it is in order to demonstrate that you have a sufficient understanding of it.

**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)

All the Zoom meetings for this course, including the meetings on 11/14/24, 11/21/24, and 12/05/24 that require discussion participation, will be recorded. To get credit for this part of the grade, you must engage

in the following class discussions: 1) Open class discussion on “COVID-19 and Beyond” scheduled for week 15 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, during the class discussion opportunities you must either ask a question of the type described above, or engage in the discussion surrounding a question that someone else has asked (including the COVID-19 discussion). 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.** So, for example, if there happens to be a total of 3 class discussion opportunities during the semester (i.e., the COVID-19 discussion plus 3 class presentations not counting your own), then in the course of the semester you need to participate for a total of at least 3 times during these discussion opportunities by providing thoughtful and pertinent questions or comments (i.e., at least one question or comment for 3 of the 4 discussion opportunities). In this example, each engagement will count for 1.67% of the total 5% credit, based on equal distribution of the 5% grade credit between 3 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 an 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:**

September 9	Last day to drop with 100% tuition refund
September 17	Last day to drop with 50% tuition refund
Sept. 18-Oct. 1	Unrestricted Withdrawal Period: 100% Tuition Liability
October 10	Midterm exam
December 12	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.

### **NOTICE OF MANDATORY REPORTING OF SEXUAL ASSAULT, SEXUAL HARASSMENT, INTERPERSONAL VIOLENCE, AND STALKING**

As a faculty member, I am designated as a "Non-Confidential Employee," and must report all disclosures of sexual assault, sexual harassment, interpersonal violence, and stalking to Mason's Title IX Coordinator per University Policy 1202. If you wish to speak with someone confidentially, please contact one of Mason's confidential resources, such as Student Support and Advocacy Center (SSAC) at 703-993-3686 or Counseling and Psychological Services (CAPS) at 703-993-2380. You may also seek assistance or support measures from Mason's Title IX Coordinator by calling 703-993-8730, or emailing [titleix@gmu.edu](mailto:titleix@gmu.edu).

### **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!**