Syllabus for BIOL 704/804:
Plant-Microbe Interactions

Spring, 2019, 3 credit hours

Class meetings: T, Th 9:40-11:00 am Spaulding Hall Room 220

Instructor: Dr. Anissa Poleatewich, Rudman Hall Rm 191
Email: anissa.poleatewich@unh.edu
Office hours: Monday 2-3 pm or by appointment

Course description: Microbes and plants have developed intriguing strategies to encourage, resist or profit from their coexistence. Several of the mutualistic or antagonistic interactions that we study illustrate broader principles and contribute to our fundamental understanding of biological processes. These interactions have a strong impact on agricultural ecosystems, and as such are also of applied importance. This course will focus on mechanisms driving plant-pathogen interactions. Emphasis will also be placed in plant-beneficial microbe interactions leading to biological control and the implications of these interactions for ecosystem functioning and sustainable agriculture.

Textbook and readings:
There is no required text for this course, but students will be responsible for assigned readings of scientific literature, which can be accessed electronically through the course website (Canvas).

Learning Objectives: The primary objective of the course is to provide students with a comprehensive overview of the various ways in which microbes interact with plants, the outcomes of that interplay, and applications of these interactions in society. By the end of the course students will be able to:

1. Describe how microorganisms interact with plants and the surrounding environment
2. Describe the basic mechanisms plants use to recognize pathogens and distinguish the different types of plant disease resistance mechanisms
3. Compare different pathogenic strategies used by bacterial and fungal pathogens to enter plants, overcome or avoid plant defenses, damage plant tissue and obtain nutrients for growth.
4. Describe the role microorganisms play in plant protection and sustainable agriculture
5. Objectively analyze the design and content of research studies in the primary scientific literature
6. Engage in and lead a productive discussion on topics related to plant-microbe interactions

Course Format and Grading:
This course is framed around a weekly schedule that includes instructor-led lecture, writing assignments, hands-on activities, and in-class discussion of scientific literature. Content and techniques will be presented on Tuesdays. Thursdays will be reserved for hands-on activities and student-led discussion of the scientific literature.

Activity	Potential points	
	704 students	**804 students**
Class participation	40	40
Leading discussion (15 pts each)	NA	30
Discussion worksheets (10 pts each)	100	80
Activities	100	100
Exams (100 pts each)	300	300
Writing assignments	100	100
Total points	**640**	**650**

Thus, you can earn approximately 640 total points between the exams, participation, worksheets and writing assignments. Grades are not curved but will be based upon the accumulated percentage of total points (#pts earned ÷ #pts possible) and will generally range as described below. All students are required to join the course MyCourses (Canvas) site.

Letter Grade	% Total Available Points
A	93-100%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%
C-	70-72%
D+	67-69%
D	63-66%
D-	60-62%
F	0-59%

Course Schedule At-A-Glance

Date	Topics	In-class Activity
Plants as a microbial habitat		
1/22	Introduction and course mechanics Overview of plant-microbe interactions	
Plant stress: Microbes as agents of plant disease		
1/24	Plant diseases	Disease cycle activity
1/29	Bacteria and fungi as plant pathogens	
1/31	Student-led paper discussion	Discuss paper#1 Xu et al. 2012
2/5	Viruses as plant pathogens	
2/7	Student-led paper discussion	Discuss paper #2 Shipp et al. 2008
How plants defend themselves (and the microbial game of chess)		
2/12	Plant responses to stress	
2/14	Student-led paper discussion	Discuss paper #3 Chen et al. 2019

Date	Topics	In-class Activity
2/19	Plant defenses and priming (SAR, ISR)	Matching game
2/21	Microbial effectors	Vegevaders game
2/26	Student-led paper discussion and review	Discuss paper #4 Soylu et al. 2003
2/28	Exam 1	
Mechanisms and use of plant resistance in agriculture		
3/5	Microbial and biochemical mediated resistance Introduce writing assignment	Mock experiment and analysis
3/7	Horizontal and vertical resistance	Group activity
3/11-15	Spring Break – no classes!	
3/19	Student-led paper discussion Science writing and communication	Discuss paper #5 Dong et al. 2017
3/21	Use of host resistance in breeding – Tom Davis	
The good guys		
3/26	Nitrogen-fixing bacteria	
3/28	Student-led paper discussion	Discuss paper #6 Hands-on demo
4/2	Mycorrhizal associations with plants	
4/4	Student-led paper discussion *Writing assignment first draft due*	Discuss paper #7 Bona et al. 2017
4/9	Plant-growth promoting microbes	
4/11	Student-led paper discussion	Discuss paper #8
4/16	Exam 2	
4/18	Plant-microbe-insect interactions and biocontrol	Case study activity
Plant microbiomes and plant health		
4/23	Microbial mediated stress tolerance	
4/25	Student-led paper discussion	Discuss paper #9 Mastouri et al. 2010
4/30	Plant-mediated microbiomes	Group activity
5/2	Use of beneficial microbes in agriculture *Writing assignment revised draft due*	Discuss paper #10
5/14	**Final Exam (Take-home due)**	

Course Webpage

The course webpage will be available in **MyCourses (Canvas)**. General course information, the syllabus, lectures, links to readings and references will be posted on this site; please monitor this frequently.

Course expectations

Participation:

Students are expected to attend class regularly, read the assigned readings before the corresponding class session and contribute substantially to class discussions. Please note that a significant part of your grade is based on your class participation, which consists of attendance, unannounced in-class writing exercises, and - most importantly - regular, informed, and meaningful contributions to class discussion.

Leading a paper discussion (804 students only):
Because one of the primary course goals is to help you understand the process of acquiring new knowledge through experiments, we will work extensively from the primary research literature. Before the in-class discussion, all students will read the assigned journal article and all students (other than the discussion leader) will write comments on a Discussion Worksheet. For each reading, a graduate student will lead a class discussion of the paper. Discussion leaders for the semester will be assigned the first day of class.

- Before leading a discussion, the discussion leader should prepare by reading some additional background material related to the paper topic.
- Discussion leaders are also required to meet with the instructors in advance to plan the discussion. Specific suggestions on leading discussions will be distributed. The student leading the discussion **does not** complete a worksheet.
- The discussion leader will present to the class a very brief background introduction and then lead a class discussion of the most important data/figures/findings in the paper.
- We will then shift to a broader discussion of the implications of the work, and discuss future experiments that might most effectively advance our understanding in this area.

Discussion worksheets:
Whenever there is a paper discussion, each student will be required to complete and turn in a typed discussion worksheet (available on canvas). This sheet is intended to encourage active, analytical reading of the paper and to prepare you for thoughtful participation in the discussion. A printed copy of your completed worksheet is due in class on the day the paper in question is discussed. Late worksheets will not be accepted. If your printer is not working, e-mail a copy of your worksheet to the instructor prior to class.

Exams:
There will be two semester exams and one final exam. The final exam will be take-home and open-book. The questions on the final will emphasize synthesis and analysis, not memorization.

Exam/Assignment Policies

1. Typically, there will be no opportunity to take a make-up technical exam for unexcused absences; the student will earn a "0" for that exam.
2. For anticipated, excused absences, it is the student's responsibility to contact me PRIOR to the exam, to schedule a make-up exam.
3. Students may also be excused from taking a regularly-scheduled exam for unanticipated reasons such as sickness or family crisis. Students are required to document (for example, note/call from doctor/nurse/dean of students) that their absence was excusable. It is the student's responsibility to contact me prior to or on the day of the exam, if possible, and then on the day of the student's return to schedule a make-up exam.

Academic Integrity: Academic honesty will apply in accordance with policies found in the annual publication Students Rights, Rules, and Responsibilities (https://www.unh.edu/student-life/2017-2018-student-rights-rules-and-responsibilities). Students must adhere to the principles and rules of the University and pursue academic work in a straightforward truthful manner, free from deception or fraud. Failure to comply could result in a failing grade for the course.

- University Academic Honesty Policy: https://www.unh.edu/studentlife/handbook/academic/academic-honesty
- Tutorial on Plagiarism: http://Cola.unh.edu/plagiarism-tutorial-0 .

In this course you are encouraged to discuss course material with each other, but you must work alone when completing written assignments and exams. Also, be alert to avoid plagiarism through the unattributed copying and use of sentences written by other persons. You should frequently consult scientific articles, books, reviews, commentaries and class notes, but you must cite in your papers and take-home exam any sources that you rely on extensively or quote directly.

Classroom-behavior and Electronic Devices: To ensure a climate of learning for all, disruptive or inappropriate behavior may result in exclusion (removal) from this class. Please be respectful about your use of electronic devices and recognize how distracting they may be to others around you. You may use a laptop, if this is your means of note taking. Cell phone/pda, etc. use, including text messaging, and videotaping and recording is not permitted in this class by Faculty Senate rule unless by instructor permission.

Disability Statement:
According to the Americans with Disabilities Act (as amended, 2008), each student with a disability has the right to request services from UNH to accommodate his/her disability. If you are a student with a documented disability or believe you may have a disability that requires accommodations, please contact Student Accessibility Services (SAS) at **201 Smith Hall**. Accommodation letters are created by SAS with the student. Please follow-up with your instructor as soon as possible to ensure timely implementation of the identified accommodations in the letter. Faculty have an obligation to respond once they receive official notice of accommodations from SAS, but are under no obligation to provide retroactive accommodations. For more information refer to www.unh.edu/studentaccessibility or contact SAS at 603.862.2607, 711 (Relay NH) or sas.office@unh.edu.

Emotional or Mental Health Distress
Your academic success in this course is very important to me. If, during the semester, you find emotional or mental health issues are affecting that success, please contact the University's Psychological and Counseling Services (PACS) (3rd fl, Smith Hall; 603 862-2090/TTY: 7-1-1) which provides counseling appointments and other mental health services.

Note: This syllabus is subject to change. Students will be promptly notified of any changes.

Rubric for Participation Grade

	Exemplary Full credit: 40 pts	Satisfactory	Limited/Unsatisfactory
Attendance and In-Class Discussion	Never missed a class or missed 1-2 classes with prior notification; always on time. Consistently active in discussions while leaving ample opportunities for others to comment. Stimulated group discussion by building on instructor or peer ideas, including building a focused argument around a specific issue, asking a new related question, or advancing a well-supported insight or oppositional hypothesis.	Missed more than two class during the semester and notified the professor in advance. Contributed sometimes to ongoing class discussions, as evidenced by affirming statements, responses to instructor questions, asking related questions, or advancing a reasonably supported insight or oppositional hypothesis.	Missed more than three classes with prior notice, or any classes without prior notice, or consistently late for class. Did not participate much in class discussions

Rubric for Discussion Worksheet Grading

	Exceeds Expectations *10 points*	Meets Expectations *6-9 points*	Doesn't Meet Expectations *1-5 points*	No Worksheet *0 points*
Understanding	Went beyond understanding the reading content to integrate it with broader course themes and material learned outside this classroom.	Demonstrated comprehension of the assigned paper's hypotheses, experiments, and results.	Errors or misconceptions about the reading.	
Communication Quality	Very clear, not unnecessarily long or wordy.	Complete, grammatically correct sentences. Typed. Met length expectations.	Grammar and spelling errors, or, very brief or excessively wordy, or, shallow coverage.	
Research Creativity	Exciting and/or original ideas for new research, of a quality found in fundable competitive grant proposals.	Logical, biologically Relevant question(s). Proposed experiment(s) that plausibly test the new hypothesis.	Proposed work would result in only minor additional progress, or does not seem to successfully test relevant questions.	