PLP 3002: Fundamentals of Plant Pathology, Fall 2021

COURSE INSTRUCTOR: Dr. Brantlee Spakes Richter
Office: 2519 Fifield Hall
Phone: 352-273-2014
Email: For class-related communications, please use email within Canvas
Office Hours: Drop-in T/Th 4:00-5:00 PM, or by appointment
LABORATORY TEACHING SUPPORT: Dr. Morgan Byron (maconn00@ufl.edu)
TEACHING ASSISTANTS: Shannon McAmis (sk.mcamis@ufl.edu), Kiersten Bushong (kbushong@ufl.edu)
COURSE WEB SITE (Canvas): https://lss.at.ufl.edu/
CLASS TIME/LOCATION:
Lectures: 2316 Fifield Hall, Tuesday and Thursday period 4 @ 10:40-11:30 am
Labs: 2306 Fifield Hall, times vary by section:
Tuesday Period 6-8, 12:50-3:50 (Section 3931)
Wednesday Period 3-5, 9:35-12:35 (Section 19GH)
Wednesday Period 7-9, 1:55-4:55 (Section 3932)
Thursday Period 6-8, 12:50-3:50 (Grad, Section 3937/3938)

COURSE: Fundamentals of Plant Pathology (PLP 3002C) and General Plant Pathology (PLP 5005C) are taught with concurrent lectures. Undergraduates are enrolled in PLP 3002, while Graduate and DPM students are encouraged to enroll in PLP 5005, so that they can receive graduate credits for the class. Lectures are the same for both courses, but the exams and grading structures are different; students enrolled in PLP 5005 are required to participate in additional discussions within the lab, have additional assignments beyond the requirements of PLP3002, and have slightly different exams, reflecting the higher expectations for graduate level study.
PREREQUISITE: BOT 2010 or BSC 2010
CREDITS: 4

TEXT: Plant Pathology 5th Ed. (2005) by G. N. Agrios, Elsevier Academic Press, Inc. Free access to the 5th Edition is available in both print and electronic version through UF course reserves. The 4th edition of this book is also acceptable.

INTRODUCTION & OBJECTIVES: Plant pathology is the science of plant diseases, the microorganisms that cause them, and the interactions between pathogens and hosts. The ultimate goal of plant pathology is to reduce the losses caused by plant diseases, thereby increasing quality and quantity of plant yields. Plant diseases are caused by many of the same types of organisms that cause diseases in animals and humans and, as such, many of the principles that apply to animal and human medicine also apply to plant diseases. This course introduces students to the many different types of plant pathogens, their basic biology, examples of the types of disease they cause, and the basic principles and concepts of disease development, spread, and management. This course will provide students with a solid, foundational understanding of disease cycles, host-pathogen interactions, and pathogen biology, sufficient to prepare them for higher-level coursework in plant pathology and/or entry-level positions in plant health related employment. The learning objectives of this course are:

1. Students are expected to attain sufficient mastery of vocabulary in plant pathology so that they can converse effectively with plant pathologists about disease problems.
2. Students will gain adequate familiarity with the resources and conventions of the field so that they can locate, understand, and evaluate information about plant diseases.

3. Students will develop firm comprehension of the mechanisms underlying disease so that they can effectively use information sources to solve problems that they will encounter in their own fields of work.
4. Students will gain a working familiarity with basic laboratory procedures and equipment relevant to diagnostics and research in the field of plant pathology, so that they can understand diagnostic and research reports and/or prepare for entry-level employment in a laboratory environment.

ATTENDANCE: You are expected to participate in every class and laboratory, and there will be weekly quizzes and/or class activities which will contribute to your course grade. **Lectures will be live-streamed**, and graded quizzes will be delivered via Canvas, allowing students to participate remotely, as needed. **Please do not attend in-person if you are sick, even if your symptoms are mild**, or if you have recently been exposed to someone with Covid-19. Absences due to illness or emergency will be excused. Absences due to observation of religious holidays or participation in official university functions will be excused *only with advance notice*. Absences due to personal planning (i.e., planning to be somewhere other than class during class time) will not be excused, and missed points may not be made up. There will be no make-up lab sessions, but alternate assignments will be provided for students who are not cleared for campus due to Covid-19 exposure, symptoms, or a positive test; when you report your symptoms and schedule a test, the UF ST&P will trigger your "not cleared" status, and that will serve as a documented excuse. If you know in advance that you must miss a lab meeting with an excused absence, you may make arrangements to attend another section, or to view the materials outside of the lab period (contingent upon specific lab exercise; some materials are time-sensitive and cannot be saved). If you miss a lab due to illness or emergency, it is your responsibility to contact the instructor before the end of the class time on Thursday; most laboratory materials are discarded at the end of Thursday's graduate lab/discussion session, and will no longer be available for your observation. Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

LABORATORY: The laboratory will emphasize principles and concepts of plant pathology through demonstrations and hands-on exercises using living organisms and prepared specimens. Labs will typically include an introduction to the lab exercise, hands-on work with laboratory materials, a "deliverable" to be handed in either at the end of the session or the beginning of the subsequent session, and a short quiz on the previous week's materials. You are expected to keep all laboratory hand-outs and assignments in a **designated lab notebook**, and bring all previous hand-outs to every class. Many of the lab exercises build on one another and/or extend over several lab and class periods, and you will be expected to have your hand-outs and notes at each stage of the activity. Some of the lab activities are experimental in nature, and accurate, detailed record-keeping will be required.

EXAMS AND GRADING: Grade categories will be distributed as follows:

Component	Percent of Grade
Exam 1	7
Exam 2	11
Exam 3	11
Exam 4	11
Final Exam or Project	15
Class Participation	5
Lab Assignments & Quizzes	25
Lab Exam	15
TOTAL	100

Exams: There will be five lecture exams (four mid-term exams and a final). The in-term exams (1-4) will be given online, and you will have a 5-day window in which to take each one, beginning immediately after the last lecture in the unit. This will allow you to (1) have some flexibility in scheduling your study time around other courses, (2) take the exam at the time of day you are most alert and in an environment in which you are comfortable, and (3) have more time to complete the exam than the standard 50-minute class period. We will use the Honorlock proctoring system for online exams. Exams 1-4 are not comprehensive; each will focus on material from the preceding set of lectures and supporting labs. The final and laboratory exams will be comprehensive, covering material from the entire semester. The **lab exam** will be held during your last regularly scheduled laboratory session, November 30 or December 01. **The final lecture examination** will be held in the regular lecture room during the university-assigned exam period, December 15 at 7:30-9:30AM.

Participation: The class participation grade will come from in-class quizzes and activities. Quizzes will be delivered through Canvas, and will only be open during the corresponding lecture. If you are attending in-person and do not have a wireless device to access Canvas, you may submit your quiz on paper at the end of the class period. In-class quizzes are open-book.

Lab Assignments: Laboratory assignments will be given with each lab exercise. There will be 10 lab hand-ins, worth 8-10 points each, plus two lab assignments (15 and 25 points), and eleven 4-point lab quizzes. Most hand-ins will be due at the end of the lab period, but a few will require follow-up observations to complete and will be due at the beginning of the following lab session. Late hand-in submissions will receive half credit, and no lab assignments will be accepted after the last lab meeting. Lab quizzes are designed to prepare you for the lab practical exam, and will begin during the second week of lab. Each quiz will consist of one or two questions or skills tests from the previous week's lab. The two remaining assignments are lab group experiments which span multiple laboratory periods, and will require production of laboratory reports.

Grade Scale: Final grades will be designated according to the following grade scale. This course uses the grade book function in Canvas for records-keeping and grade calculation; grades will be calculated on a percentage basis, but total course points associated with each percentage are given here for your convenience. For information on current UF policies for assigning grade points, see: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Letter Grade	Percentage
A	92.00 – 100
A-	90.00 – 91.99
B+	88.00 – 89.99
B	82.00 – 87.99
B-	80.00 – 81.99
C+	78.00 – 79.99
C	72.00 – 77.99
C-	70.00 – 71.99
D+	68.00 – 69.99
D	62.00 – 67.99
D-	60.00 – 61.99
E	00.00 – 59.99

ACADEMIC HONESTY

It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. In this course, any violation of the academic integrity expected of you will result in a minimum academic sanction of a failing grade on the assignment or assessment. Any alleged violations of the Student Honor Code will result in a referral to Student Conduct and Conflict Resolution. Please review the Student Honor Code and Student Conduct Code at sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/

Some assignments in this course will require collaboration, and collaborative study is generally encouraged. You may discuss your answers on lab hand-in sheets and in-class participation quizzes, unless otherwise notified; however, you may not work or collaborate with others on lab quizzes, lab exams, lecture exams, or any other take-home exams or assignments. If you have any questions about expectations for a particular assignment, about what constitutes plagiarism, or about how to ensure that you are using and crediting sources appropriately, please speak with your instructor or a TA. We are here to help, and we would much rather give you the guidance you need to avoid academic integrity violations, than have to report them after they occur!

SOFTWARE USE

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

CAMPUS HELPING RESOURCES

The University of Florida provides a wide range of student services to help with common issues which may interfere with your success, including disabilities, physical or mental illness, food insecurity, and personal safety. You can find links to many of these resources at http://www.ufl.edu/student-life/health-safety/
If you are experiencing problems that are interfering with your studies and you don't see an appropriate resource listed here, contact the Dean of Students Office (https://www.dso.ufl.edu/), and they can help connect you with the appropriate support.

Counseling Services: Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575,* www.counseling.ufl.edu/cwc/

- *Career Resource Center,* Second Floor JWRU, 392-1601, www.crc.ufl.edu/

Services for Students with Disabilities: 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/
The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

COURSE EVALUATIONS

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/.

RECORDING POLICIES

I have always allowed audio recordings of my lectures as a study aid, and this semester I will be making video recordings available to all students through our class TEAMS space. UF has recently published the following updated guidelines for student recordings of class activities.

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 the student's own personal educational use;
2. In connection with a complaint to the University where the recording is made;
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.

The instructor reserves the right to change or modify information provided in the syllabus. Class announcements supersede syllabus statements. Any changes to the syllabus or schedule will be posted as announcements in the class site in Canvas. If substantial schedule changes are needed (e.g. due to hurricane closures, etc.), a revised syllabus will also be posted.

COURSE LECTURE SCHEDULE Fall 2021

Date	Topic	Reading (Agrios 5th ed.)*
	Unit 1: Central Concepts in Plant Pathology	
Aug 24	Introduction to Plant Pathology, terminology	Ch. 1: 4-42, 71-75
Aug 26	Diagnosis & Abiotic disorders	Ch.10: 358-383
Aug 31	History of Plant Pathology	Ch. 1: 4-42, 71-75
Sept 02	Disease development and cycles	Ch. 2: 77-89, 96-102
	Unit 2: Fungal & Bacterial Pathogens	
Sept 07	Intro Plant Pathogenic Fungi & Fungal diseases	Ch. 11: 385-404
Sept 09	Fungal Pathogens I: Cytrids, Mucoromycota, Ascomycota	Ch. 11: 433-561
Sept 14	Fungal Pathogens II: Basidiomycota	Ch. 11: 593-610
Sept 16	Fungal Pathogens III: Rusts & Smuts	Ch. 11: 562-592
Sept 21	Non-Fungi Fungal Pathogens: Oomycota & Co.	Ch. 11: 404-433
Sept 23	Intro Plant Pathogenic Bacteria & Bacterial Diseases	Ch. 12: 615-627
Sept 28	Bacterial Pathogens	Ch. 12: 627-703
	Unit 3: Virus & Nematode Pathogens	
Sept 30	Intro Plant Pathogenic Viruses & Viral Diseases I	Ch. 14: 724-756
Oct 05	Intro Plant Pathogenic Viruses & Viral Diseases II	Ch. 14: 724-756
Oct 07	Virus Pathogens	Ch. 14: 757-824
Oct 12	Plant Pathogenic Nematodes	Ch. 15: 826-836
Oct 14	Nematode Pathogens	Ch. 15: 838-874
	Unit 4: Pathogenicity & Host Defense	
Oct 19	Effects of pathogens on plant physiology	Ch. 3: 106-121
Oct 21	Genetics of Plant disease	Ch. 4: 125-174
Oct 26	Genetics of Plant disease	Ch. 4: 125-174
Oct 28	How pathogens attack plants	Ch. 5: 176-203
Nov 02	Plant defenses – structural & biochemical	Ch. 6: 210-236
Nov 04	Environmental factors & infectious diseases	Ch. 7: 249-265
Nov 09	Catch-up and Review	
	Unit 5: Epidemiology & Management	
Nov 11	*Veterans Day Holiday – no classes*	
Nov 16	Plant disease epidemiology	Ch. 8: 266-289
Nov 18	Cultural control of plant diseases	Ch. 9: 295-348
Nov 23	Biocontrol of plant diseases	Ch. 9: 295-348
Nov 25	*Thanksgiving break – No classes*	
Nov 30	Chemical control of plant diseases	Ch. 9: 295-348
Dec 02	Integrated approaches to disease management	Ch. 9: 295-348
Dec 07	Exam Review	

* Numbers refer to chapters/pages of Agrios 5th edition text which correspond to the lecture topics. You will not be responsible for materials within these chapters that are not also covered in lecture and/or lab. The Agrios text covers many more examples than will be highlighted in this class; use the course slides as a guide to direct your reading.

PLP 3002, Fall 2021
LABORATORY SCHEDULE*

Date	Topic	KP
Aug 24-26	Plant Pathology Lab Orientation • Lab Etiquette & Microscope protocols • Symptoms and Signs of Plant Diseases • Biotic vs. abiotic plant problems • Plant Pathology literature and diagnostic information	
Aug 31-Sept 02	Lab skills & Koch's Postulates • Lab Media production • Diagnostics vs. Proof of pathogenicity • Fungal isolations	Fungal Isolations
Sept 07-09	Groups of fungal plant pathogens • Sexual and asexual fungal structures • Identifying fungal phyla	Culture examination & transfers; assess "consistency"
Sept 14-16	Foliar diseases by fungi • Leaf spots • Powdery & Downy Mildews • Rusts (*Puccinia* spp.) • Plant inoculations with foliar pathogens (Koch's Postulates)	Examine transfers, re-transfer as needed to isolate
Sept 21-23	Soilborne diseases by fungi • Oomycete zoospore production (*Phytophthora, Pythium*) • Take-All disease & hyphopodia • Sclerotia, microsclerotia, & rhizomorphs	Examine transfers for sporulation; ID to genus if possible (homework: methods reference!)
Sept 28-30	Bacterial plant pathogens • Bacterial isolation & inoculation techniques • Identification tests • Fluorescent pigment (siderophore) demonstration	Inoculations
Oct 05-07	Plant Viruses – inoculation of plant viruses • Mechanical & Insect inoculation	Symptom check, discussion of KP with viruses
Oct 12-14	Nematodes • Anatomical features used in identification • Endo- vs. ectoparasites • Nematode extraction methods	Symptom check, reisolate if ready
Oct 19-21	Plant Viruses, part 2 – virus symptoms • Inoculation results: effects of host species and temperature • Symptoms associated with viral diseases • Confirmation via virus test strips (immuno-assay)	Re-isolations
Oct 26-28	Pathogenicity Factors & Host Resistance • Appressoria production: genetics & environment • *S. sclerotiorum*: oxalic acid & appressoria • Bacterial virulence genes and bacterial races	Re-isolation transfers (to pure culture)
Nov 02-04	Koch's Postulates wrap-up • Molecular tools for pathogen identification	DNA extraction & PCR
Nov 09-11	*Veterans Day – Open Lab for KP, no scheduled activities*	

Nov 16-18	Koch's Postulates wrap-up: pathogen identification • Molecular data analysis	Sequence data analysis
Nov 23-25	*Thanksgiving – Review, no scheduled activities*	
Nov 30-Dec 02	Laboratory Exam	Report Due

**This is a tentative schedule, based on previous semesters; topics and dates may be adjusted. Students will be notified in class of any changes to the course schedule.*

Laboratory PPE Requirements:
Laboratory meetings will begin the first week of class, so please be prepared with proper laboratory attire. Although we do our best to reduce or eliminate potential hazards in the lab activities, participation in laboratory meetings will require the following PPE (personal protective equipment).

- **Closed-toe shoes** must be worn at all times in the lab. We use glass routinely and harsh chemicals occasionally. Broken glass and exposed toes are a bad combination.
- **Face masks** must be worn throughout the lab meetings. We work with unidentified fungi and other potential biohazards, and masks reduce exposure as well as contamination issues. If you have fungal allergies, please consider using an N-95 mask. We will provide masks for students who do not bring their own.
- **Eye protection** is recommended for all lab meetings and will be required for specific lab activities. If you normally wear contact lenses, please consider wearing glasses during lab meetings. Contact lens wearers are particularly vulnerable to eye infections (keratitis), and we absolutely will encounter the two most common fungal genera that cause opportunistic eye infections, *Fusarium* and *Aspergillus*, as well as common bacterial infection agents such as *Pseudomonas aeruginosa*.
- **Gloves** will be available for your use throughout the semester, and will be recommended or required for specific lab activities. If you have any open cuts or abrasions on your hands, please request gloves for the lab period, regardless of the activity.

Plant Pathology lab courses are a great way to learn general pathology techniques. We use many of the same techniques that you would find in a medical diagnostic clinic, but we work with organisms that present lower risk to our health than most human and animal pathogens. Even so, we will encounter some organisms that can infect humans, or that frequently cause allergic or inflammatory responses. Any unknown microbe growing in a dish should be treated as a potential hazard.

Further reading on hazards from plant-associated organisms:

- https://www.cdc.gov/contactlenses/fungal-keratitis.html CDC summary of fungal keratitis (corneal infections)
- https://www.aao.org/eye-health/diseases/what-is-bacterial-keratitis American Academy of Ophthalmology summary of bacterial keratitis
- https://www.cedars-sinai.org/health-library/diseases-and-conditions/a/allergic-fungal-sinusitis.html Cedars Sinai overview of allergic fungal sinusitis. The most common fungi that cause both allergic and invasive sinusitis are *Aspergillus* spp., which are found in decaying plant material. These fungi are commonly isolated as "contaminants" when working with plant pathogens, as are *Mucor* spp., which can cause very rare but more devastating mucormycosis infections.
    - https://onlinelibrary.wiley.com/doi/10.1002/lary.29632 Bonus Track, COVID-19 Edition: Original Report of invasive fungal sinusitis cases associated with COVID-19 (Note: having had a recent case of COVID-19 has now been added to the list of predisposing factors for fungal sinusitis).