

PLP 3002: Fundamentals of Plant Pathology, Fall 2024

COURSE INSTRUCTOR: Dr. Brantlee Spakes Richter

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Office Hours: by appointment

Laboratory Teaching Support: Dr. Morgan Byron (maconn00@ufl.edu)

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Peer Teaching Assistants: Savannah Beaulieu, Ruby Noland, Michaela Vanderburg

COURSE WEB SITE (Canvas): <https://elearning.ufl.edu/>

CLASS TIME/LOCATION:

Lectures: FIF 2316 Tuesday and Thursday period 4 @ 10:40-11:30 am

Laboratory: BLRB 152 **24602, Section 3931:** Tuesday Period 6-8, 12:50-3:50

24603, Section 19GH: Wednesday Period 6-8, 12:50-3:50

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 enrolled in PLP 5005. 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, 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

RECOMMENDED 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. Missed activity grades may only be made up for excused absences, at the discretion of the instructor. **Lectures will be live-streamed**, allowing students to participate remotely as needed. Please do not attend in-person if you are sick, even if your symptoms are mild. Attendance quizzes may be completed remotely, and 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. 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 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: Points will be distributed as follows:

Component	Percent of Grade
Exam 1	7
Exam 2	12
Exam 3	12
Exam 4	12
Final Exam or Project	16
Class Participation / In-class Quizzes	5
Lab Assignments & Quizzes	20
Lab Exam	16
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 3-day window in which to take each one, beginning immediately after the last lecture period 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. Exams 1-4 are not comprehensive; each will focus on material from the preceding set of lectures and supporting labs. Exams 2-4 will be proctored using the Honorlock service. The final and laboratory exams will be in-person and comprehensive, covering material from the entire semester. The **lab exam** will be held during your last regularly scheduled laboratory session. **The final lecture examination** will be held in the regular lecture room during the university-assigned exam period.

Participation: The class participation grade will come from in-class quizzes and activities. Quizzes will be open-book and open-discussion, and will typically cover material in the current day's lecture. Quizzes are delivered via Canvas, and are only open during the regular class time. Those attending in-person will have the option to submit quiz answers on paper. Late arrivals will not be given extra time to complete the quiz, and there will be no make-up quizzes for unexcused absences.

Lab Assignments: Laboratory assignments will be given with each lab exercise. There will be 10 lab hand-ins, worth 8-10 points each, ten 4-point lab quizzes, and one semester-long lab team assignment (20 points for check-in assignments, 40 points for the final report). 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 following lab session. Late hand-in submissions will receive half credit, and no lab assignments will be accepted after the lab practical exam. 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.

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. 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, but your answers should be in your own words. You may not work or collaborate with others on lecture exams, lab quizzes, lab 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 2024

Date	Topic	Reading (Agrios 5 th ed.)*
Unit 1: Central Concepts in Plant Pathology		
Aug 22	01 Introduction to Plant Pathology, terminology	Ch. 1: 4-42, 71-75
Aug 27	02 Diagnosis & Abiotic disorders	Ch.10: 358-383
Aug 29	03 History of Plant Pathology	Ch. 1: 4-42, 71-75
Sept 03	04 Disease development and cycles	Ch. 2: 77-89, 96-102
Unit 2: Fungal & Bacterial Pathogens		
Sept 05	05 Intro Plant Pathogenic Fungi & Fungal diseases	Ch. 11: 385-404
Sept 10	06 Fungal Pathogens I: Chytrids, Mucoromycota, Ascomycota	Ch. 11: 433-561
Sept 12	07 Fungal Pathogens II: Basidiomycota	Ch. 11: 593-610
Sept 17	08 Fungal Pathogens III: Rusts & Smuts	Ch. 11: 562-592
Sept 19	09 Non-Fungi Fungal Pathogens: Oomycota & Co.	Ch. 11: 404-433
Sept 24	10 Intro Plant Pathogenic Bacteria & Bacterial Diseases	Ch. 12: 615-627
Sept 26	11 Bacterial Pathogens	Ch. 12: 627-703
Oct 01	Exam 2 Catch-up and Review	
Unit 3: Virus & Nematode Pathogens		
Oct 03	12 Intro Plant Pathogenic Viruses & Viral Diseases I	Ch. 14: 724-756
Oct 08	13 Intro Plant Pathogenic Viruses & Viral Diseases II	Ch. 14: 724-756
Oct 10	14 Virus Pathogens	Ch. 14: 757-824
Oct 15	15 Plant Pathogenic Nematodes	Ch. 15: 826-836
Oct 17	16 Nematode Pathogens	Ch. 15: 838-874
Oct 22	17 Exam 3 Opens; Genetics of Plant disease	Ch. 4: 125-174
Unit 4: Pathogenicity & Host Defense		
Oct 24	18 Genetics of Plant disease	Ch. 4: 125-174
Oct 29	19 How pathogens attack plants	Ch. 5: 176-203
Oct 31	20 Plant defenses – structural & biochemical	Ch. 6: 210-236
Nov 05	21 Environmental factors & infectious diseases	Ch. 7: 249-265
Nov 07	Exam 4 Catch-up and Review	
Nov 12	22 Plant disease epidemiology	Ch. 8: 266-289
Unit 5: Epidemiology & Management		
Nov 14	23 Cultural control of plant diseases	Ch. 9: 295-348
Nov 19	24 Biocontrol of plant diseases	Ch. 9: 295-348
Nov 21	25 Chemical control of plant diseases	Ch. 9: 295-348
	<i>Thanksgiving break – No classes Nov 25-30</i>	
Dec 03	26 Integrated approaches to disease management	Ch. 9: 295-348
Dec 10	Final Exam @ 3:00-5:00 PM (In-person, in regular classroom or REC location)	

* Numbers refer to Agrios 5th edition text corresponding 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 2024
LABORATORY SCHEDULE*

Date	Topic	KP tentative schedule
Aug 27-28	Plant Pathology Lab Orientation <ul style="list-style-type: none"> • Lab Etiquette & Microscope protocols • Observing pathogens • Symptoms and Signs of Plant Diseases & Abiotic Disorders 	
Sept 03-04	Lab skills & Koch's Postulates <ul style="list-style-type: none"> • Lab Media production • Diagnostics vs. Proof of pathogenicity • Fungal isolations 	Fungal Isolations <input checked="" type="checkbox"/>
Sept 10-11	Groups of fungal plant pathogens <ul style="list-style-type: none"> • Sexual and asexual fungal structures • Identifying fungal phyla • Fungal culture examination & transfers (Koch's Postulates) 	Culture examination & transfers; assess "consistency" <input checked="" type="checkbox"/>
Sept 17-18	Foliar diseases by fungi <ul style="list-style-type: none"> • Leaf spots • Powdery & Downy Mildews • Rusts (<i>Puccinia</i> spp.) • Plant inoculations with foliar pathogens (Koch's Postulates) 	Examine transfers, re-transfer as needed to isolate
Sept 24-25	Soilborne diseases by fungi <ul style="list-style-type: none"> • Oomycete zoospore production (<i>Phytophthora</i>, <i>Pythium</i>) • Take-All disease & hyphopodia • Sclerotia, microsclerotia, & rhizomorphs 	Examine transfers for sporulation; ID to genus if possible (homework: methods reference!)
Oct 01-02	Bacterial plant pathogens <ul style="list-style-type: none"> • Bacterial isolation & inoculation techniques • Identification tests • Fluorescent pigment (siderophore) demonstration 	Inoculations <input checked="" type="checkbox"/>
Oct 08-09	Plant Viruses – inoculation of plant viruses <ul style="list-style-type: none"> • Mechanical & Insect inoculation • (Koch's Postulates: re-isolation, discussion of KP with viruses) 	Symptom check, discussion of KP with viruses
Oct 15-16	Nematodes <ul style="list-style-type: none"> • Anatomical features used in identification • Endo- vs. ectoparasites • Nematode extraction methods 	Symptom check, reisolate if ready <input checked="" type="checkbox"/>
Oct 29-30	Plant Viruses, part 2 – virus symptoms <ul style="list-style-type: none"> • Inoculation results: effects of host species and temperature • Symptoms associated with viral diseases • Confirmation via virus test strips (immuno-assay) 	Re-isolations, transfers (to pure culture)
Nov 05-06	Pathogenicity Factors & Host Resistance <ul style="list-style-type: none"> • Appressoria production: genetics & environment • <i>S. sclerotiorum</i>: oxalic acid & appressoria • Bacterial virulence genes and bacterial races 	DNA extraction & PCR
Nov 12-13	Koch's Postulates wrap-up <ul style="list-style-type: none"> • Molecular tools for pathogen identification • Molecular data analysis 	Symptom Confirmation Sequence data analysis
Nov 19-20	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.*

☑ indicates check-in assignment associated with this task.

Laboratory PPE Requirements:

Laboratory meetings will begin the second 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** should be worn throughout the lab meetings. We work with unidentified fungi and other potential biohazards, and masks reduce exposure as well as contamination issues. 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.