

# PLP6223C Viral Pathogens of Plants

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**Lab Assist.:** TBD



## Course Time/ Location:

10 weeks, Jan 23 – April 07, 2017  
Lectures: 2564 Fifield Hall, Monday, Wednesday  
and Friday, period 7 (1:55 pm - 2:45 pm),  
Labs: 2306 Fifield Hall, Monday and Wednesday,  
periods 8 and 9 (3:00 pm - 4:55 pm)



**Prerequisites:** Graduate or upper undergraduate course in Plant Pathology; and Graduate or upper undergraduate course in Biochemistry or Molecular Biology.

**Class Website:** <http://plantpath.ifas.ufl.edu/classes/PLP4222-PLP6223/index.html>

This website presents all the lectures, papers, protocols, instructions needed for each lecture, laboratory and discussion session by week and day.

**Office Hours:** Office hours: by appointment

## Course Description:

The course is designed as a survey of contemporary concepts and principles of viruses that infect plants: their taxonomy and nomenclature, their structure and genetics, how they interact with their plant hosts, vectors, and other viruses, and their epidemiology, ecology and management. While the taxonomic relationship of plant viruses to other viruses is discussed the focus of the course is on plant viruses. The laboratory is designed to give students hands-on experience with techniques used to characterize and identify viruses in plants through the assignment of a plant infected with an “unknown” virus that students must identify using techniques taught in the laboratory section. Students are expected to summarize the identification of their unknown virus in a short communication in the format of a **Plant Disease Note**. Discussion sessions, which are formal discussions of pre-assigned recent papers, will take place during laboratory periods. Discussion periods are designed to supplement information presented in lecture, as well as to teach students how to interpret papers on various topics in plant virology. Graduate students will demonstrate their

comprehension of plant virology by producing a **Case Study** of a plant virus in the form of a narrated PowerPoint presentation shown to the class in the last week of the course.

**Course Objectives:**

Plant viruses are one of the largest groups of plant pathogens, second only to fungi in their diversity and species number. Due to their inability to be cultured or easily visualized, they are often poorly understood by non-virologists. Correct identification to genus or species requires a solid background in the use and interpretation of appropriate techniques. Plant viruses can be managed, however successful management requires a correct identification of the virus, as well as a good understanding of the biology of the viruses (ie how the virus in question is able to survive, what means it can use to move from plant to plant and from one season to the next) and then the application of appropriate methods to limit spread and yield loss.

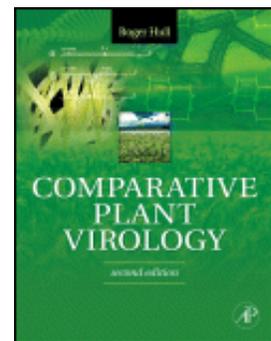
Students completing this course will:

- Understand the concept of a virus species, and understand the criteria used to place virus species in families and genera;
- Understand the basics of how viruses replicate and spread throughout a plant;
- Be able to correctly use and interpret basic techniques such as ELISA and rt-PCR for the identification of plant viruses;
- Be able to find and interpret resources on plant virology in order to adopt reasonable approaches to manage plant viruses.

**Required Textbook:**

The textbook for this course is Comparative Plant Virology by R. Hull 2<sup>nd</sup> Edition, published by Academic Press.

In addition papers that expand on the content are presented on the webpage for download for each lecture and laboratory section. Current papers are assigned for discussion during laboratory periods.



**Grading and Assessment:**

**Grades: Will be based on the following assessments:**

Assessment	Points	@ Percent of Grade
One Midterm Exam	100	21
Final Exam	100	21
Check Points	70	15
Virus Model	70	15
Plant Disease Note	50	11
Plant Virus Case Study	90	19
	480	@100%

### Grades and Grade Points:

In accordance with current University of Florida policy, grade points will be assigned as follows:

Letter Grade	Grade Point	Percentage
A	4.0	90 or above
A-	3.67	87-89
B+	3.33	84-86
B	3.0	80-83
B-	2.67	77-79
C+	2.33	74-76
C-	1.67	67-69
D+	1.33	64-66
D	1.0	60-63
D-	0.67	57-59
E	0.0	56 or below

For information on current UF policies for assigning grade points, see: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**Exams:** There will be two exams: one in-class plus one cumulative final exam. Copies of previous exams (without answers) to aid students in their preparation are provided on the class website. A review will be scheduled a few days before each exam.

**Checkpoints (quizzes):** Eight checkpoints are scheduled for Wednesday lab periods, and will be given at the beginning of the period. Checkpoints are designed to help students stay current in the class and will give students an opportunity to use information or concepts presented over the past week in lecture, laboratory or discussion and to help prepare students for questions that will appear on the exams. Checkpoints will take approximately 10 to 20 minutes to complete.

### Assignments:

- |      |   |               |
|------|---|---------------|
| I.   | Model of a Virus Particle.....              | Due Mar 13    |
| II.  | Plant Disease Note.....                     | Due Mar 27    |
| III. | Virus Case Study: Narrated PowerPoint ..... | Due Apr 03-05 |

### Model of a Virus Particle

In order for students to improve their understanding of viruses in genera and virus structure in particular, student teams will build a model of a virus particle that represents one plant virus genus. The particle will be to scale and will reflect details of the virus architecture, including the genome. Students may construct the particle from any materials as they prefer, and specific guidelines will be provided.

**Plant Disease Note:** Results of the laboratory sessions where students will learn and use techniques to identify their “unknown” virus will be summarized in the form of a Plant Disease Note, a short communication present in the international journal Plant Disease. The Plant Disease Note will be graded on how closely the paper adheres to the rules of publication as presented in the “Instructions to Authors” section of Plant Disease (a copy will be made available to students) as well as students’ presentation and interpretation of their results.

**Case Study:** Each graduate student will select a virus from a provided list and conduct a literature review of the virus. This review will be presented in the form of a narrated PowerPoint presentation. Information presented in the talk will come from refereed papers or reviews (not extension publications). The presentation should be 15 minutes in length. The objective of this exercise is to give students additional information about individual viruses, and for individual students to demonstrate their ability to read and interpret plant virology literature. Evaluation will be based on demonstration of correct understanding of the papers, accuracy of the information presented, and quality of the presentation. Accurate and well-executed presentations will be selected for posting on the departmental website. (<http://plantpath.ifas.ufl.edu/plant-virus-profiles/>)

**Class Participation:** Students are expected to come prepared to participate in discussion sections and class lectures. Students should demonstrate an understanding of the concepts and ability to integrate the information presented. Questions are encouraged. Grading will be based on demonstration of understanding of the concepts, and demonstrated preparation for the discussions, as well as frequency of participation.

**Class Attendance:** Participation is a vital part of both the course experience and the course grade. Students will be expected to arrive at each class on time and prepared to fully participate in the lecture, lab, or other class activities. If you must miss a class due to illness or other extenuating circumstances, you must notify the instructor as soon as possible preferably before the absence. Absences due to personal planning (leaving town, attending club functions, picking someone up at the airport, etc.) will not be excused, and missed points may not be made up.

**Make-up Work:** If you are ill on an exam day, notify the instructor as soon as you are able, and a make-up exam will be scheduled for you. If you must miss an exam for any other reason, please make arrangements ahead of time to reschedule. In most cases, **laboratory exercises cannot be made up.** Laboratory cultures, demonstrations, and other materials are typically prepared in advance, often ephemeral or expendable by nature, and cannot be easily recreated.

## LECTURE SCHEDULE SPRING 2017

The following is an outline of what we will cover in each lecture. This schedule is subject to change, and the instructor will inform you of any changes.

Date	Lecture No.	Date	Title
<b>Week 1</b>	<b>1</b>	<b>Jan 23</b>	Orientation, Introduction to Viruses
	<b>2</b>	<b>Jan 25</b>	Viruses as Pathogens
	<b>3</b>	<b>Jan 28</b>	Plant Virus Architecture
<b>Week 2</b>	<b>4</b>	<b>Jan 30</b>	Classification and Taxonomy of Plant Viruses
	<b>5</b>	<b>Feb 01</b>	Subviral Agents
	<b>6</b>	<b>Feb 03</b>	Replication of plus sense ssRNA viruses
<b>Week 3</b>	<b>7</b>	<b>Feb 06</b>	Replication of minus and ambisense RNA viruses
	<b>8</b>	<b>Feb 08</b>	Replication of dsRNA and Subviral Agents
	--	<b>Feb 10</b>	No class
<b>Week 4</b>	<b>9</b>	<b>Feb 13</b>	Replication of DNA viruses
	<b>10</b>	<b>Feb 15</b>	Diagnosis and Detection of Plant Viruses
	--	<b>Feb 17</b>	Review for Midterm Exam
<b>Week 5</b>	--	<b>Feb 20</b>	<b>MIDTERM EXAM</b>
	<b>11</b>	<b>Feb 22</b>	Biological and Nucleic Acid Based Assays
	<b>12</b>	<b>Feb 24</b>	Virus Isolation and Serology
<b>Week 6</b>	<b>13</b>	<b>Feb 27</b>	Protein Based Assays
	<b>14</b>	<b>Mar 01</b>	Plant Virus Strains, Variability, Virus Evolution
	<b>15</b>	<b>Mar 03</b>	Plant Virus Movement and Distribution within Plants
<b>Spring Break Mar 06 - Mar 10</b>			
<b>Week 7</b>	<b>16</b>	<b>Mar 13</b>	Host Mechanisms of Resistance
	<b>17</b>	<b>Mar 15</b>	Post-transcriptional Gene Silencing
	--	<b>Mar 17</b>	No class
<b>Week 8</b>	<b>18</b>	<b>Mar 20</b>	Genetic Engineering Plants for Virus Resistance
	<b>19</b>	<b>Mar 22</b>	Transmission by Hemipteran Vectors
	<b>20</b>	<b>Mar 24</b>	Transmission by Other Vectors
<b>Week 9</b>	<b>21</b>	<b>Mar 27</b>	Seed and Pollen Transmission
	<b>22</b>	<b>Mar 29</b>	Principles of Virus Management I
	<b>23</b>	<b>Mar 31</b>	Principles of Virus Management II
<b>Week 10</b>	<b>24</b>	<b>Apr 03</b>	Virus Management - in class exercise
	--	<b>Apr 05</b>	Review for Final Exam
	--	<b>Apr 07</b>	<b>FINAL EXAM</b>

**LABORATORY/DISCUSSION SCHEDULE  
SPRING 2016**

This schedule is subject to change, and the instructor will inform you of any changes.

WEEK NO.	DATE	LABORATORY/DISCUSSION
Week 1	Jan 23	Assignment of lab partners; Assignment of unknowns; Greenhouse Orientation Lab 1a. Mechanical Inoculation for maintenance Lab 2a. Storage of Virus Cultures
	Jan 25	Lecture: Recognition of Virus-Induced Symptoms <b>Assignment I: Construct a Virus Particle</b> <b>Assignment III: Virus Case Study</b> Discussion Session I – Plant viruses in the human body
Week 2	Jan 30	Lab 1b. Observe, record local symptoms Lab 3. Electron Microscopy
	Feb 01	Lab 1b. Observe, record systemic symptoms Discussion Session II – Are plant viruses pathogenic to humans? <b>Check Point 1</b>
Week 3	Feb 06	Lab 1b. Observe and record systemic symptoms Paper Discussion Session III – Plant Disease Notes <b>Assignment II: Plant Disease Note</b>
	Feb 08	<b>Check Point 2</b>
Week 4	Feb 13	Lab 2b. Complete: Storage of Virus Cultures Laboratory Lab 4a. Mechanical inoculation to biological indicators
	Feb 15	Lab 5a. RT-PCR - RNA Virus Detection – Extraction Lab 4b. Observe, record local symptoms on indicator plants <b>Check Point 3</b>
Week 5	Feb 20	Lab 5b. RT-PCR - Transcription, Amplification Lab 4b,c. Observe, record local/systemic symptoms on indicator plants
	Feb 22	Lab 5c. RT-PCR – Visualize Results and Discuss Lab 4b,c. Observe, record systemic symptoms on indicator plants <b>Check Point 4</b>
Week 6	Feb 27	Lab 5b,c. Observe, record systemic symptoms on indicator plants Paper Discussion Session IV – Plant Viruses in Unusual Places
	Mar 01	Paper Discussion Session V tbd <b>Check Point 5</b>
Week 7	Mar 13	<b>Assignment I Due: Virus Particle</b> Lab 6a. Identification using amplicon sequences
	Mar 15	Lab 6b,c. Identification using amplicon sequences <b>Check Point 6</b>
Week 8	Mar 20	Lab 7a. DAS-ELISA- Extraction, Bind to Ab
	Mar 22	Lab 7b,c. DAS-ELISA – Conjugate, Substrate, Discuss Results <b>Check Point 7</b>
Week 9	Mar 27	<b>Assignment II Due: Plant Disease Note (submit by email)</b>
	Mar 29	Paper Discussion Session??
Week 10	Apr 03	<b>Assignment III Due: Presentation of Case Studies</b>

## DESCRIPTION OF LABORATORIES

### Laboratory 1. Mechanical Inoculation

- 1a. Short term preservation of unknown virus by mechanical inoculation
- 1b. Observe and record systemic symptoms on inoculated plants

### Laboratory 2. Storage of Virus Cultures

- 2a. Storage of Virus Cultures
- 2b. Complete Storage Lab

**(Laboratory: Correct Use of Micropipettes – required for students who have not taken PLP 3002C or PLP5005C)**

### Laboratory 3. Identification of Plant Viruses Electron Microscopy

- 4a. Obtain familiarity with the electron microscope and procedures
- 4b. Obtain image of leaf dip of ‘unknown’ by arrangement with Ms. Karen Kelly

### Laboratory 4. Identification of Plant Viruses Using Biological Indicators

- 5a. Inoculate a range of plant hosts
- 5b. Observe and record local symptoms on inoculated plants
- 5c. Observe and record systemic symptoms on inoculated plants

### Laboratory 5. Identification of Plant Viruses Using RT-PCR - Detection of RNA Viruses

- 6a. Extraction of RNA
- 6b. Reverse transcription, amplification
- 6c. Detection (gel electrophoresis, staining, photo) and Discuss results

### Laboratory 6. Identification Using Amplicon Sequences

- 7a. Gel purify and clean amplicons, send for sequencing
- 7b. Analysis of amplicon sequence
- 7c. Discussion of results

### Laboratory 7. Identification of Plant Viruses Using DAS-ELISA

- 7a. Add antigen,
- 7b. Add conjugated secondary antibody, substrate, record results
- 7c. Discuss results

## UF Policies:

**UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES:** Students requesting accommodation for disabilities must first register with the Dean of Students Office (<http://www.dso.ufl.edu/drc/>). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

**UNIVERSITY POLICY ON ACADEMIC MISCONDUCT:** As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: *"On my honor, I have neither given nor received unauthorized aid in doing this assignment."* It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g., assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/SCCR/honorcodes/honorcode.php>

**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.

**ONLINE COURSE EVALUATION PROCESS:** Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at <https://evaluations.ufl.edu>. Time during a lab period will be available for students to complete the evaluation. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results>.

**Getting Help:** 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/](http://www.counseling.ufl.edu/cwc/)
  - Counseling Services
  - Groups and Workshops
  - Outreach and Consultation
  - Self-Help Library
  - Training Programs
  - Community Provider Database
  - Career Resource Center, First Floor JWRU, 352-392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)