**PLP6223C Viral Pathogens of Plants**



**Instructor:** Jane E. Polston, Ph.D.

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**Course Time/ Location:**

10 weeks,May 17 – July 29, 2019

Lectures: 2564 Fifield Hall, Monday, Wednesday and Friday, period 4 (12:30 pm – 1:45 pm),

Labs: 2306 Fifield Hall, Monday and Wednesday, periods 5 and 6 (2:00 pm – 4:45 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. Discussion sessions, which are formal discussions of pre-assigned papers, will take place during laboratory periods. Discussion periods are designed to supplement information presented in lecture, as well as to help students develop the confidence to read and correctly interpret papers in plant virology so that they can acquire new knowledge as needed in their careers. Class Exercises are designed to give students an opportunity to learn through creating and give students an opportunity to use the information they are learning. Wet laboratories are designed to give students hands-on experience to enhance comprehension of course content.

**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. Many plant viruses can be managed, however successful management requires a correct identification of the virus using appropriate assays, as well as a good understanding of the biology of the viruses (ie how the virus moves from plant to plant, survives from field to field, season to season), 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 a detection technique 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.

**Recommended Textbook:**

# The textbook for this course is Comparative Plant Virology by R. Hull 2nd Edition, published by Academic Press. Chapters in the book are assigned with each lecture to improve students’ understanding of the course content. While not required reading, even skimming the chapters will help with comprehension.

# In addition, papers that expand on the content are presented on the webpage for download for each lecture and laboratory section.

**Grading and Assessment:**

|  |  |  |
| --- | --- | --- |
| Assessment | Points | @ Percent of Grade |
| One Midterm Exam  | 100 | 22 |
| Final Exam  | 100 | 22 |
| Check Points (14 pts ea) | 100 | 22 |
| Virus Model | 70 | 16 |
| Plant Virus Case Study  | 80 | 18 |
|  | 450 | 100% |

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

|  |  |  |
| --- | --- | --- |
| **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 |

**Grades and Grade Points:**

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

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. Questions may be comprehensive as lecture content presented each week builds on previous content. Checkpoints will take approximately 10 to 20 minutes to complete.

**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.

**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 literature, 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/>)

**Assignments:**

1. Model of a Virus Particle and Powerpoint..… Due June 10
2. Mid-Term Exam………………………………………. June 17
3. Virus Case Study: Narrated PowerPoint …… Due July 15-17
4. Final Exam………………………………………………. July 29

**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.

**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, professional conferences 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**

**SUMMER 2019**

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** |
| **Week 1** | **1** | **May 17** | Orientation, Introduction to Viruses  |
| **Week 2** | **2** | **May 20** | Viruses as Pathogens  |
|  | **3** | **May 22** | Plant Virus Architecture  |
|  | **4** | **May 24** | Classification and Taxonomy of Plant Viruses |
| **Week 3** |  | **May 27** | Holiday  |
|  | **5** | **May 29** | Subviral Agents  |
|  | **6** | **May 31** | Plant Virus Movement and Distribution within Plants |
| **Week 4** | **7** | **June 03** | Replication of plus sense ssRNA viruses |
|  | **8** | **June 05** | Replication of minus and ambisense RNA viruses |
|  | **9** | **June 07** | Replication of dsRNA and subviral agents |
| **Week 5** | **10** | **June 10** | Replication of DNA viruses  |
|  | **11** | **June 12** | Plant Virus Strains, Variability, Virus Evolution |
|  |  | **June 14** | Review for Midterm Exam |
| **Week 6** |  | **June 17** | **MIDTERM EXAM**   |
|  | **12** | **June 19** | Diagnosis and Detection of Plant Viruses |
|  | **13** | **June 21** | Biological and Nucleic Acid Based Assays |
| **Break June 24-28** |
| **Week 7** | **14** | **July 01** | Virus Isolation and Serology |
|  | **15** | **July 03** | Protein Based Assays |
|  |  | **July 05** | Holiday |
| **Week 8** | **16** | **July 08** | Seed and Pollen Transmission |
|  | **17** | **July 10** | Transmission by Hemipteran Vectors |
|  | **18** | **July 12** | Transmission by Other Vectors  |
| **Week 9** | **19** | **July 15** | Host Mechanisms of Resistance |
|  | **20** | **July 17** | Post-transcriptional Gene Silencing |
|  | **21** | **July 19** | Genetic Engineering Plants for Virus Resistance |
| **Week 10** | **22** | **July 22** | Principles of Virus Management I |
|  | **23** | **July 24** | Principles of Virus Management II |
|  |  | **July 26** | Review for Final Exam |
| **Week 11** |  | **July 29** | **FINAL EXAM** |

# LABORATORY/DISCUSSION SCHEDULE

**SUMMER 2019**

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

|  |  |  |
| --- | --- | --- |
| **WEEK** **NO.** | **DATE** | **LABORATORY/DISCUSSION** |
| **Week 1** | **---** | **No lab session**  |
| **Week 2** | **May 20** | **Assignment I: Construct a Virus Particle** **Assignment II: Virus Case Study**Discussion Session – Plant Viruses in the Human Body |
|  | **May 22** | Laboratory 1a: Transmission Electron Microscope Laboratory 1b. With prior arrangement with K. Kelly |
| **Week 3** | **May 27** | **Holiday**  |
|  | **May 29** | Laboratory 1c. Review EM results, Work on virus particle model |
| **Week 4** | **June 03** | Work on virus particle model |
|  | **June 05** | Paper Discussion: Virus movement with Amit Levy |
| **Week 5** | **June 10** | **Assignment I Due: Virus Particle** |
|  | **June 12** | Paper Discussion: with Garry Sunter. TBD |
| **Week 6** | **June 17** | Midterm |
|  | **June 19** | Demonstration: Recognition of Virus-Induced Symptoms and Relevance to Diagnosis and IdentificationViral Metagenomics |
| **Break June 24-28** |
| **Week 7** | **July 01** | Laboratory 2a: ELISA  |
|  | **July 03** | Laboratory 2b: ELISA  |
| **Week 8** | **July 08** | Paper Discussion: – Are plant viruses pathogenic to humans? |
|  | **July 10** | Exercise: Viruses and Seed Health with R. Johnson (Sakata Seed America) |
| **Week 9** | **July 15** | **Assignment II Due: Presentation of Case Studies**  |
|  | **July 17** | **Assignment II Due: Presentation of Case Studies**  |
| **Week 10** | **July 22** | Lab Exercise: Virus Management |
|  | **July 24** | Lab Exercise: Virus Management  |
| **Week 11** | **July 29** | **FINAL EXAM** |

**DESCRIPTION OF LABORATORIES**

**Laboratory 1. Identification of Plant Viruses Electron Microscopy**

 1a. Learn procedures for creating a specimen for the TEM, create a grid with sample

1b. View grid in TEM and obtain image of leaf dip of ‘unknown virus’ by

 arrangement with Ms. Karen Kelly, Dir. CORE EM facility

1c. Create a powerpoint of images and share with class

**Laboratory 2. Identification of Plant Viruses Using ELISA**

 2a. Addition of antigen

 2b. Addition of conjugate and substrate

## **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 you obligation to upload 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/)