SYLLABUS PLP6404 PLANT DISEASE EPIDEMIOLOGY

Instructor:
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Course Description:
This graduate-level course is designed to provide students with an introduction to the theory, concepts and applications of plant disease epidemiology. Students will carry out an experiment on the infection cycle of one pathogen and will be introduced to equipment and quantitative methods used in the analysis of epidemics and the factors that affect epidemic development. Practical applications of epidemiology in plant disease management will also be presented. Students will discuss recent refereed papers fundamental to epidemiology.

Credit Hours: 4

Course Objectives:
- Provide students with basic understanding of epidemiological theory and concepts
- Understand the implications of quantitative components of the infection cycle
- Introduce students to equipment and methods used in epidemiological research
- Demonstrate the practical applications of epidemiology in plant disease management
- Identify current areas of epidemiological research

Prerequisite: Introductory Plant Pathology

Class Schedule: Mondays, 8.30-11.30 am
Wednesdays, 8.30-9.30 am
Fridays, 8.30-11.30 am

Class Location: Monday, Wednesday and Friday: 2564 Fifield Hall or 2306 Fifield Hall (Plant Path Teaching lab), as indicated on the class schedule; first day of class (January 7, 2015) in Fifield Hall room 2564

Lecture Topics:

I. General overview of plant epidemiology
    History and terminology
    Measurement of disease
    Disease progress over time
II. Factors that affect epidemic development
    Influence of pathogen on disease development
        Airborne pathogens (quantification of inoculum, virulence, ecology)

- Seed- and soil-borne pathogens
- Vector-borne pathogens
- Influence of host plant on disease development
  - Plant growth
  - Host resistance
- Influence of environment on disease development
  - Moisture, temperature, wind, radiation, chemical environment
  - Meteorological variables and their measurement

III. Basic concepts in plant disease epidemiology
- Disease progress in time
  - Simple models
  - Model fitting, model comparison
  - Comparison of epidemics
  - Complex models
  - Advanced topics
- Analysis of plant disease epidemics using SAS
- Disease progress in space
  - Dispersal gradients, long-range transport
  - Spatial patterns of disease and inoculum
  - Spatial variability, sampling, interplot interference

IV. Modeling of plant disease
- Intro to modeling, relational diagrams
- Modeling of vector-borne diseases
- Modeling of a disease cycle
- Modeling of population dynamics in the rhizosphere

V. Epidemiology and disease management
- Epidemiological strategies for disease management
  - Reducing initial inoculum
  - Reducing the rate of epidemic development
  - Reducing the duration of epidemic development
- Crop loss assessment
  - Components of crop loss
  - Assessment techniques
  - Modeling crop loss
- Disease forecasting, advisories, risk indices
- Decision aids for disease management
  - Examples of forecasting models
  - Example of a risk model
- Risk analysis and management of enteric pathogens associated with plants

Lab, greenhouse, field and computer exercises:

I. Disease assessment on the computer and in the field

II. A class experiment on quantification of successive phases in the disease cycle (with *Colletotrichum* sp. on melons), including analysis of data and entering parameter estimates into a simulation model

III. Various exercises to calculate parameter values for different disease progress curves over time and spread of disease in space using SAS;

BRING YOUR OWN LAPTOP WITH SAS ON IT!!!!

IV. Various computer simulation and modeling exercises.

Requirements for grading:

Lab reports (individual):

Lab Experiments: January 23, February 9 and March 30
Computer exercises: February 6, February 13, February 16, February 20, February 23, February 27, March 9, March 20, April 10, April 13

Quizzes and Exams:

Quiz 1 and 2: February 4 and April 1
Midterm Exam: March 11
Final Exam: May 1

Literature presentations (groups of three students):

Presentations: February 20, February 25, March 13, March 18, March 25, April 3, April 15

Grading:

Quizes (together): 10%
Midterm exam 10%
Final Exam 30%
Experimental lab reports 20%
Computer exercise reports 20%
Oral presentations 10%