

**GRADUATE DEGREE CONCENTRATIONS**  
**NCSU DEPARTEMNT OF PLANT PATHOLOGY (CAL)**  
**START FALL SEMESTER, 2010**

**DESCRIPTION:**

The Department of Plant Pathology at North Carolina State University offers a graduate program tailored to the needs of today's science and agriculture with a vision to the future. All candidates for graduate degree in Plant Pathology complete a curriculum that provides a fundamental knowledge base for any career path in plant pathology or related science. NCSU Plant Pathology has a record of placement of essentially all of its graduates in professional positions in academia, industry, public agencies, or related professional organizations. Training of students with a broad background for placement of graduates in positions related to applied (translational) plant pathology remains as a strength of the department. The demographic for increased graduate specialization within plant pathology has increased steadily over the last decade, however, with potential employers developing programs within their own organizations that demand demonstrated expertise in sub-disciplines such as host-microbe interactions, ecology and evolutionary biology. The opportunity for specialization within the NCSU Plant Pathology graduate degree is primarily provided through individual student thesis research projects. We expect that the demand for demonstrated specialization within student courses of study will also increase in the coming decades as emphases in research areas such as genomic sciences, food and energy security, and the global effects of climate change continue to emerge. The breadth of expertise in research and academic programs among our relatively large number of faculty make NCSU Plant Pathology uniquely positioned to address this challenge by offering graduate degree concentrations in 1) translational plant pathology; 2) evolutionary ecology and population biology; 3) host-microbe interactions.

**OBJECTIVES:**

A solid and comprehensive education in the fundamentals of plant pathology is provided through an established core of introductory courses that will continue to be required of all NCSU Plant Pathology graduate students (core course details are listed in the Degree Requirements section). To provide educational focus and demonstrated proficiency within a sub-discipline of plant pathology, our graduate students will have the option to choose from a menu of existing advanced plant pathology courses under each proposed degree concentration (presented below) to achieve a recognized academic specialization. A new "Advances in" class has been developed within each degree concentration to serve as a capstone course to present the latest advances within the sub-discipline to enrolled students.

Declaration of a Plant Pathology graduate degree concentration is optional (students may opt to have no degree concentration). Students currently have the opportunity to enroll in the Master of Plant Pathology (non-thesis), Master of Science, and Doctor of Philosophy degree programs in NCSU Plant Pathology. The options for official concentration(s) within these degree programs not only provide greater flexibility to develop student Plans of Work, they also recognize concentrations of specialization on the student's official academic transcript to enhance competitiveness in their chosen career path.

A) **Translational Plant Pathology**: Students that complete this degree concentration will have competency in the development and application of fundamental plant pathology research and contemporary technology to address plant disease management in ways that are effective, economical, and environmentally sound.

B) **Evolutionary Ecology & Population Biology**: Students that complete this degree concentration will have expertise in the interaction of microbes with their biotic and abiotic environments, how these interactions influence microbial and host genetics from the individual to community level, and the dynamics of these processes in disease spread and development of predictive models.

C) **Host-Microbe Interactions**: Students that complete this degree concentration will have expertise in the molecular and physiological basis of disease and host resistance, genetic adaptations for parasitism, signaling and response between microbes and hosts, and the application of genomic science to investigate and manage disease agents.

### **<sup>3</sup>DEGREE CONCENTRATION REQUIREMENTS:**

MPP = 12 credits of plant pathology core curriculum + 6 credits PP within optional concentration

MS = 12 credits of plant pathology core curriculum + 6 credits PP within optional concentration

PhD = 12 credits of plant pathology core curriculum + 12 credits PP within optional concentration

<sup>3</sup> As indicated in the Objectives above, **declaration of any degree concentration is optional** for Plant Pathology graduate students. Students are encouraged to declare a degree concentration of their choice early in their graduate program, with the potential to declare more than one degree concentration using courses cross-listed under each concentration below to meet the requirements of more than one concentration. **PhD students that choose not to declare a degree concentration** will be required to complete each of the three new “Advances in...” capstone courses presented below (PP 760, PP 761, and PP 762) to demonstrate doctoral-level proficiency in a broad plant pathology curriculum. **MS students that choose not to declare a degree concentration** will be required to complete two of the three new “Advances in...” capstone courses presented below (PP 760, PP 761, and/or PP 762) to demonstrate masters-level proficiency in a broad plant pathology curriculum. All students are expected to follow the general requirements listed for each respective degree as presented in the August 1, 2011 revisions.

**Concentration 1) Translational Plant Pathology**: PP Core Curriculum (12 credits) + <sup>1</sup>“Advances in Translational Plant Pathology” (3 credits) + any options below or DGP-approved substitute:

PP 503 – Bacteria and Their Interactions with Plants

PP 505 – Introductory Plant Virology

PP 575 – Introduction to Mycology

PP 540 – Tropical Plant Pathology

PP 727 – Ecology of Soil Ecosystems

PP 728 – Soilborne Plant Pathogens

PP 790 (section) – Host Plant Resistance to Pathogens

PP 790 (section) – Epidemiology: Theory and Application

PP 590/790 (section) – Field Plant Pathology in NC

PP 790 (section) – Phytonematology

<sup>1</sup>PP 790 (section) – Advances in Translational Plant Pathology (will become PP 761)

**Concentration 2) Evolutionary Ecology & Population Biology:** PP Core Curriculum (12 credits) + <sup>2</sup>“Advances in Evolutionary Ecology & Population Biology” (3 credits) + any options below or DGP-approved substitute:

PP 503 –Bacteria and Their Interactions with Plants

PP 505 – Introductory Plant Virology

PP 575 – Introduction to Mycology

PP 715 – Applied Evolutionary Analysis of Population Genetic Data

PP 727 – Ecology of Soil Ecosystems

PP 610/810 (003) – Climate Change and Agriculture

PP 730 – Fungal Genetics and Physiology

PP 790 (section) – Host Plant Resistance to Pathogens

PP 790 (section) – Epidemiology: Theory and Application

PP 790 (section) – Molecular Genetics of Plant Response to Stress

PP 790 (section) – Phytonematology

<sup>2</sup>PP 790 (section) – Advances in Evolutionary Ecology & Population Biology (will become PP 762)

**Concentration 3) Host-Microbe Interactions:** PP Core Curriculum (12 credits) + <sup>3</sup>“Advances in Host-Microbe Interactions” (3 credits) + any options below or DGP-approved substitute:

PP 503 –Bacteria and Their Interactions with Plants

PP 505 – Introductory Plant Virology

PP 575 – Introduction to Mycology

PP 610/810 (section) – Functional Genomics

PP 715 – Applied Evolutionary Analysis of Population Genetic Data

PP 725 – Molecular Biology of Plant Viruses

PP 730 – Fungal Genetics and Physiology

PP 790 (section) – Host Plant Resistance to Pathogens

PP 795 (section) – Bacterial Quorum Sensing & Its Consequences

PP 790 (section) – Molecular Genetics of Plant Response to Stress

PP 790 (section) – Phytonematology

<sup>3</sup>PP 790 (section) – Advances in Host-Microbe Interactions (will become PP 760)

### **“ADVANCES IN...” CAPSTONE COURSES:**

Three new, letter-grade, 3-credit “Advances in...” capstone courses will be implemented as listed below. Completion of a minimum of one 3-credit capstone course will be a requirement for students to earn one of the proposed new Plant Pathology degree concentrations. The three new “Advances in...” courses will initially be offered as Special Topics (PP 790 with sections as designated by R&R) for the first two academic years (AY 2010-2012) before submission of course actions for approval (as their final PP 760, 761, and 762 designations). **“Advances in Host-Microbe Interactions” is next scheduled for offering in Fall 2012 (as a PP 790 section). “Advances in Translational Plant Pathology” is next scheduled for offering in Spring 2012 (as a PP 790 section). “Advances in**

**Evolutionary Ecology & Population Biology” will be scheduled for initial offering in Spring 2013 (as a PP 790 section).**

Each capstone course will include three instructors that will teach one of the three consecutive 5-week modules during the semester. Students must enroll for the entire semester to earn the full 3 credits – enrolling for partial credit in individual 5-week modules is not permitted. One of the three designated instructors will serve as the course Coordinator for that semester and be responsible for course organization and administration, including final grade tally and grade submission. Each instructor will choose a current topic of their choice for their 5-week module that is germane to the course objectives (see below). It is envisioned that each module will be primarily a literature/discussion-based format on current advanced topics with the potential for lectures to introduce students to new topics. Classes will meet for three 50-minute lectures per week (ie. MWF) to provide a maximum of 15 class periods to devote to the topic(s) of choice covered in each instructor’s module.

All Plant Pathology faculty members are expected to teach a 5-week module in the capstone courses on a rotating basis (approximately once every 3 years). Instructors and their chosen topics will be entered into Registration & Records the Spring or Fall semester before the course is taught (per usual procedure). The instructor who will serve as course coordinator for a particular capstone course can provide details on proposed course content to prospective students. A brief description of the three capstone courses appears below:

**<sup>1</sup>PP 760 – Advances in Host-Microbe Interactions (offered in Fall of even-numbered years, next offered in Fall 2012 as a PP 790 section)**

OBJECTIVES: A 3 credit-hour course composed of three, 5-week modules to cover contemporary and dynamic topics such as parasitic strategies, post-genomic pathology, quorum sensing, gene silencing, pathogen effectors/toxins, molecular plant-oomycete interactions, etc. Completion of at least 3 credits of an Advances course is required in any degree concentration.

**<sup>2</sup>PP 761 – Advances in Translational Plant Pathology (offered in Spring of even-numbered years, next offered in Spring 2012 as a PP 790 section)**

OBJECTIVES: A 3 credit-hour course composed of three, 5-week modules to cover contemporary and dynamic topics such as innovations in disease management, disease forecasting, oomycete diagnosis and management, fungicide resistance, sustainable disease management, etc. Completion of at least 3 credit-hours of an Advances course is required in any degree concentration

**<sup>3</sup>PP 762 – Advances in Evolutionary Ecology & Population Biology (offered in Spring of odd-numbered years, next offered in Spring 2013 as a PP 790 section)**

OBJECTIVES: A 3 credit-hour course composed of three, 5-week modules to cover contemporary and dynamic topics such as molecular epidemiology, disease spread in nature, real-time evolution, oomycete evolution and disease spread, pathogen phylogeny, etc. Completion of at least 3 credit-hours of an Advances course is required in any degree concentration.