

Plant Pathology (PPTH)

PPTH 194. Individual Study. 1-5 Credits.

PPTH 196. Field Experience. 1-15 Credits.

PPTH 199. Special Topics. 1-5 Credits.

PPTH 291. Seminar. 1-5 Credits.

PPTH 292. Global Practicum: Study Abroad. 1-15 Credits.

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

PPTH 294. Individual Study. 1-5 Credits.

PPTH 299. Special Topics. 1-5 Credits.

PPTH 379. Global Seminar. 1-6 Credits.

NDSU instructed experience or field study in a foreign country. Conducted in English for residence credit. Pre-requisite: Prior approval by International Student and Study Abroad Services and major department. May be repeated. Standard Grading.

PPTH 391. Seminar. 1-5 Credits.

PPTH 392. Global Practicum: Study Abroad. 1-15 Credits.

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

PPTH 394. Individual Study. 1-5 Credits.

PPTH 399. Special Topics. 1-5 Credits.

PPTH 424L. Fundamental Plant Pathology Laboratory. 1 Credit.

Etiology, symptomatology and control of representative plant diseases and demonstrations. Gain hands-on experience through plant pathology laboratory techniques. Coreq: PPTH 424. Dual-listing: PPTH 624L.

PPTH 424. Fundamental Plant Pathology. 2 Credits.

This course provides a broad-based understanding of the basic principles of plant pathology. Topics include history of the science and the causes, effects, diagnosis, and management of economic plant diseases. The emphasis is on plant diseases of field and horticultural plant species that are economically important to the region, potentially impactful for modern consumers, or are pertinent to the history of the science. Coreq: PPTH 424L. Dual-listing: PPTH 624.

PPTH 435. Principles of Plant Disease Management. 1 Credit.

This course focuses on the principles and practices of plant disease management, specifically addressing diseases that affect field and forage crops. It explores various strategies, such as the use of fungicides, host resistance, cultural practices, and biological control, to effectively manage plant diseases. Coreq: PPTH 435 and PPTH 436 and PPTH 437. Dual-listing: PPTH 635.

PPTH 436. Fungicide: Basics, Resistance, and Emerging Trends. 1 Credit.

This course will provide a comprehensive overview of fungicides and nematicides, including their mode of action, resistance development, pesticide regulations, and factors influencing their performance in the field. Topics covered will include timing, formulation, label reading, application rate, mobility, adjuvants, spray and nozzle equipment, pesticide drift, and precision agriculture solutions. Dual-listing: PPTH 636.

PPTH 437. Practices of Plant Disease Management Research. 1 Credit.

This course is a comprehensive guide to designing and implementing trials for evaluating plant disease management strategies. It covers principles of experimental design, trial setup, data collection using multiple tools (visual observation to the use of precision agriculture), and analysis methods. The course emphasizes practical skills and real-world applications. Dual-listing: PPTH 637.

PPTH 442. Practical Nematology. 1 Credit.

This course focuses on important plant-parasitic nematodes on crops. The covered topics include current nematode occurrence status, general knowledge of nematode morphology, basic biology and epidemiology, nematode vector of virus, nematode and virus detection and their association, field sampling, early detection, identification and enumeration, molecular diagnostics of nematode species, nematode data interpretation, real-world problems and scenarios, and management strategies. Critical discussion on the nematode problems and scenarios and practical application of the knowledge will be conducted. Dual-listing: PPTH 642.

PPTH 443. Greenhouse Inoculation and Phenotyping of Crop Diseases. 1 Credit.

This course will provide students with hands-on experience in inoculating and phenotyping major crop diseases under controlled greenhouse conditions. The course will cover basic principles and methods on inoculation and evaluation of fungal, bacterial and viral diseases in major crops, including wheat, barley, bean and pulse crops, canola, soybean, potato, sugar beet, and sunflower. Dual-listing: PPTH 643.

PPTH 445. New Science and Technology in Crop Protection. 1 Credit.

This course provides information and knowledge on current and emerging scientific discoveries and technologies poised to revolutionize crop protection. The basic science underlying techniques such as CRISPR-Cas9 and its derived techniques, broad-spectrum and durable disease resistance strategies, genetic engineering and minichromosome technology, artificial intelligence & precision agriculture, microbiomes, biocontrols, and biofertilizers, phytonanotechnology, RNAi and Bioclay, synthetic biology and novel pesticides, as well as modeling, genomic, and phenomic selection will be explained. The benefits, limitations and regulations of those technologies to be applied in crop protection will be discussed. The course is targeted at traditional students as well as industry stakeholders who seek continuing education. Prereq: PPTH 424. Dual-listing: PPTH 645.

PPTH 447. Fundamentals of Molecular Techniques in Agriculture. 1 Credit.

This course provides an overview of essential molecular and immunological techniques used in agricultural research and diagnostics, including Polymerase Chain Reaction (PCR), Reverse Transcription PCR (RT-PCR), digital droplet PCR (ddPCR), and Enzyme-Linked Immunosorbent Assay (ELISA). It also introduces students to laboratory safety, orientation, and best practices in molecular research, emphasizing the skills necessary for modern agricultural applications. Through lectures, instructional videos, and case studies, participants will build a strong foundation in both laboratory operations and molecular techniques critical for diagnostics and research. Dual-listing: PPTH 647.

PPTH 448. Plant Disease Diagnostics and Quantification. 1 Credit.

Class lectures describe the classical and modern techniques that are used to diagnose and quantify plant diseases in farmer fields as well as under controlled environments. The main techniques include disease symptom and sign-based diagnostics, enzyme-linked immunosorbent assay (ELISA), microscopic examinations, nucleic acid (DNA/RNA) based detection and next-generation sequencing. Students are required to submit a term paper at the end of the course. The course involves critical discussion on the application of techniques, methodology, data collection, and analysis. Prereq: PPTH 447. Dual-listing: PPTH 648.

PPTH 457. Landscape Plant Pathology. 2 Credits.

Diseases of landscape plants, including forest trees, turfgrass, and nursery/greenhouse plants, with a focus on identification, biology, and management. Prereq: PPTH 424. Dual-listing: PPTH 657.

PPTH 460. Fungal Biology. 3 Credits.

Fungal ecology, morphology, genetics, physiology, taxonomy, and relevance to humans. 2 lectures, 1 laboratory. Prereq: BIOL 150, PPTH 324. F (even years) {Also offered for graduate credit - see PPTH 660.}.

PPTH 462. Identification and Management of Non-Soybean Oil and Legume Crop Diseases. 1 Credit.

This course has been designed to increase knowledge in disease identification, disease development, and use of appropriate management tools for diseases in canola, dry edible bean, flax, pulse crops (chickpea, lentil, field pea) and sunflower. Emphasis is placed on highest-acreage crops and highest-impact diseases in the United States. Dual-listing: PPTH 662.

PPTH 463. Identification and Management of Soybean and Corn Diseases. 1 Credit.

This course has been designed to increase knowledge in disease identification, disease development, and use of appropriate management tools for diseases in soybean and corn. Emphasis will be place on diseases most common and/or economically important in the United States. Dual-listing: PPTH 663.

PPTH 464. Identification and Management of Small Grain Diseases. 1 Credit.

This course has been designed to increase knowledge in disease identification, disease development, and use of appropriate management tools for diseases in wheat, barely, oat and rye. Dual-listing: PPTH 664.

PPTH 491. Seminar. 1-5 Credits.**PPTH 492. Global Practicum: Study Abroad. 1-15 Credits.**

Pre-Arranged study at accredited foreign institutions (study abroad), domestic institutions (National Student Exchange) or on approved study abroad programs. Pre-requisite: Sophomore standing and prior approval by International Student and Study Abroad Services and major department. Graded 'P' or 'F' (Undergraduate), or 'S' or 'U' (Graduate).

PPTH 494. Individual Study. 1-5 Credits.**PPTH 496. Field Experience. 1-15 Credits.****PPTH 499. Special Topics. 1-5 Credits.****PPTH 624L. Fundamental Plant Pathology Laboratory. 1 Credit.**

Etiology, symptomatology and control of representative plant diseases and demonstrations. Gain hands-on experience through plant pathology laboratory techniques. Coreq: PPTH 624L. Dual-listing: PPTH 424L.

PPTH 624. Fundamental Plant Pathology. 2 Credits.

This course provides a broad-based understanding of the basic principles of plant pathology. Topics include history of the science and the causes, effects, diagnosis, and management of economic plant diseases. The emphasis is on plant diseases of field and horticultural plant species that are economically- important to the region, potentially-impactful for modern consumers, or are pertinent to the history of the science. Coreq: PPTH 624L. Dual-listing: PPTH 424.

PPTH 635. Principles of Plant Disease Management. 1 Credit.

This course focuses on the principles and practices of plant disease management, specifically addressing diseases that affect field and forage crops. It explores various strategies, such as the use of fungicides, host resistance, cultural practices, and biological control, to effectively manage plant diseases. Coreq: PPTH 635 and PPTH 636 and PPTH 637. Dual-listing: PPTH 435.

PPTH 636. Fungicide: Basics, Resistance, and Emerging Trends. 1 Credit.

This course will provide a comprehensive overview of fungicides and nematicides, including their mode of action, resistance development, pesticide regulations, and factors influencing their performance in the field. Topics covered will include timing, formulation, label reading, application rate, mobility, adjuvants, spray and nozzle equipment, pesticide drift, and precision agriculture solutions. Dual-listing: PPTH 436.

PPTH 637. Practices of Plant Disease Management Research. 1 Credit.

This course is a comprehensive guide to designing and implementing trials for evaluating plant disease management strategies. It covers principles of experimental design, trial setup, data collection using multiple tools (visual observation to the use of precision agriculture), and analysis methods. The course emphasizes practical skills and real-world applications. Dual-listing: PPTH 437.

PPTH 642. Practical Nematology. 1 Credit.

This course focuses on important plant-parasitic nematodes on crops. The covered topics include current nematode occurrence status, general knowledge of nematode morphology, basic biology and epidemiology, nematode vector of virus, nematode and virus detection and their association, field sampling, early detection, identification and enumeration, molecular diagnostics of nematode species, nematode data interpretation, real-world problems and scenarios, and management strategies. Critical discussion on the nematode problems and scenarios and practical application of the knowledge will be conducted. Dual-listing: PPTH 442.

PPTH 643. Greenhouse Inoculation and Phenotyping of Crop Diseases. 1 Credit.

This course will provide students with hands-on experience in inoculating and phenotyping major crop diseases under controlled greenhouse conditions. The course will cover basic principles and methods on inoculation and evaluation of fungal, bacterial and viral diseases in major crops, including wheat, barley, bean and pulse crops, canola, soybean, potato, sugar beet, and sunflower. Dual-listing: PPTH 443.

PPTH 645. New Science and Technology in Crop Protection. 1 Credit.

This course provides information and knowledge on current and emerging scientific discoveries and technologies posed to revolutionize crop protection. The basic science underlying techniques such as CRISPR-Cas9 and its derived techniques, broad-spectrum and durable disease resistance strategies, genetic engineering and minichromosome technology, artificial intelligence & precision agriculture, microbiomes, biocontrols, and biofertilizers, phytonanotechnology, RNAi and Bioclay, synthetic biology and novel pesticides, as well as modeling, genomic, and phenomic selection will be explained. The benefits, limitations and regulations of those technologies to be applied in crop protection will be discussed. The course is targeted at traditional students as well as industry stakeholders who seek continuing education. Dual-listing: PPTH 445.

PPTH 647. Fundamentals of Molecular Techniques in Agriculture. 1 Credit.

This course provides an overview of essential molecular and immunological techniques used in agricultural research and diagnostics, including Polymerase Chain Reaction (PCR), Reverse Transcription PCR (RT-PCR), digital droplet PCR (ddPCR), and Enzyme-Linked Immunosorbent Assay (ELISA). It also introduces students to laboratory safety, orientation, and best practices in molecular research, emphasizing the skills necessary for modern agricultural applications. Through lectures, instructional videos, and case studies, participants will build a strong foundation in both laboratory operations and molecular techniques critical for diagnostics and research. Dual-listing: PPTH 447.

PPTH 648. Plant Disease Diagnostics and Quantification. 1 Credit.

Class lectures describe the classical and modern techniques that are used to diagnose and quantify plant diseases in farmer fields as well as under controlled environments. The main techniques include disease symptom and sign-based diagnostics, enzyme-linked immunosorbent assay (ELISA), microscopic examinations, nucleic acid (DNA/RNA) based detection and next-generation sequencing. Students are required to submit a term paper at the end of the course. The course involves critical discussion on the application of techniques, methodology, data collection, and analysis. Dual-listing: PPTH 448.

PPTH 657. Landscape Plant Pathology. 2 Credits.

Diseases of landscape plants, including forest trees, turfgrass, and nursery/greenhouse plants, with a focus on identification, biology, and management. Prereq: PPTH 624. Dual-listing: PPTH 457.

PPTH 660. Fungal Biology. 3 Credits.

Fungal ecology, morphology, genetics, physiology, taxonomy, and relevance to humans. 2 lectures, 1 laboratory. F (even years) {Also offered for undergraduate credit - see PPTH 460.}.

PPTH 662. Identification and Management of Non-Soybean Oil and Legume Crop Diseases. 1 Credit.

This course has been designed to increase knowledge in disease identification, disease development, and use of appropriate management tools for diseases in canola, dry edible bean, flax, pulse crops (chickpea, lentil, field pea) and sunflower. Emphasis is placed on highest-acreage crops and highest-impact diseases in the United States. Dual-listing: PPTH 462.

PPTH 663. Identification and Management of Soybean and Corn Diseases. 1 Credit.

This course has been designed to increase knowledge in disease identification, disease development, and use of appropriate management tools for diseases in soybean and corn. Emphasis will be place on diseases most common and/or economically important in the United States. Dual-listing: PPTH 463.

PPTH 664. Identification and Management of Small Grain Diseases. 1 Credit.

This course has been designed to increase knowledge in disease identification, disease development, and use of appropriate management tools for diseases in wheat, barely, oat and rye. Dual-listing: PPTH 464.

PPTH 690. Graduate Seminar. 1-3 Credits.

PPTH 695. Field Experience. 1-15 Credits.

PPTH 696. Special Topics. 1-5 Credits.

PPTH 751. Physiology Of Plant Disease. 3 Credits.

Infection, penetration, recognition, nutrient transfer, toxins, photosynthesis, and physiological materials. Use of tools, equipment, and supplies used in the industry and application of basic design styles, holiday designs, and displays. 1 lecture, 1 two-hour laboratory. S (odd years).

PPTH 752. Plant Nematology. 3 Credits.

Nematode morphology, classification, biology, molecular identification and quantification; interaction of nematodes with other pathogens, molecular mechanisms of plant-nematode interactions, and nematode disease management. 2 lectures, 1 two-hour laboratory. F (odd years).

PPTH 754. Plant Disease Epidemiology. 3 Credits.

Temporal and spatial dynamics of diseases and causative pathogens in plant populations. 2 lectures, 1 laboratory. F (even years).

PPTH 757. Advanced Techniques in Plant Pathology. 3 Credits.

Review of traditional and latest tools and techniques available to conduct research in plant pathology. Two lectures.

PPTH 758. Bacterial, Nematode and Viral Diseases of Plants. 4 Credits.

Biology, epidemiology, and management of plant diseases caused by bacteria, nematodes and viruses.

PPTH 759. Host-Parasite Genetics. 3 Credits.

Host-parasite genetics including genetics of plant and pathogens and gene-for-gene relationships. 3 lectures. S (even years).

PPTH 760. Fungal Genetics. 4 Credits.

Biology and genetics of fungi. Emphasis on genes, genomes, and genetic control of growth and development, physiology, and etiology of fungi. 2 lectures, 2 laboratories. F (odd years).

PPTH 767. Effectoromics. 3 Credits.

Introduction and evolution of microbe effector research from changes in immune response models to modern effector identification techniques.

PPTH 790. Graduate Seminar. 1-3 Credits.

PPTH 791. Temporary/Trial Topics. 1-5 Credits.

PPTH 792. Graduate Teaching Experience. 1-6 Credits.

PPTH 793. Individual Study/Tutorial. 1-5 Credits.

PPTH 794. Practicum/Internship. 1-10 Credits.

PPTH 795. Field Experience. 1-15 Credits.

PPTH 796. Special Topics. 1-5 Credits.

PPTH 797. Master's Paper. 1-3 Credits.

PPTH 798. Master's Thesis. 1-10 Credits.

PPTH 898. Continuing Enrollment. 1-9 Credits.

For graduate students who have completed all necessary credits of course work including thesis (798) and dissertation (899) on their approved Plan of Study, but who have not yet completed and submitted their thesis or dissertation. This course does not count towards the credit requirements for the degree and is not financial aid eligible. Department consent required to enroll.

PPTH 899. Doctoral Dissertation. 1-15 Credits.