

# PLANT PATHOLOGY AND MICROBIOLOGY

## Undergraduate Study

The department participates in the interdepartmental undergraduate Microbiology major. See [/collegeofagricultureandlifesciences/microbiology/](#) for more information.

## Graduate Study

The department offers studies for the degrees master of science and doctor of philosophy with a major in plant pathology, and minor work for students majoring in other departments or programs. A master of science nonthesis option is available. The department also participates in the interdepartmental majors in microbiology; toxicology; genetics; plant biology; molecular, cellular, and developmental biology; ecology and evolutionary biology; and sustainable agriculture.

Students entering graduate programs in the department need a sound background in the physical, biological, and mathematical sciences as well as adequate preparation in English.

Graduates have a broad understanding of the biology and management of plant pathogenic microorganisms and the interactions of pathogens with their host plants. They understand the relationship between plant pathology and allied disciplines and are able to communicate effectively with scientific colleagues and the general public in both formal and informal settings. Graduates are able to address complex plant disease problems facing agricultural and bioscience professionals, taking into account the related ethical, social, legal, and environmental issues. They are skilled in research procedures, communicating research results, and writing concise and persuasive grant proposals.

### Courses primarily for undergraduates:

#### MICRO 101: Microbial World

(3-0) Cr. 3. F.

*Prereq: High school biology or equivalent*

Introduction to the importance of viruses, bacteria, fungi, archaea and parasites both to humans and to the biosphere. Topics include past and present microbial impact on humans and society, ecology and diversity of microbes, biotechnology and microbial impact on the biosphere.

#### MICRO 110: Professional and Educational Preparation in Microbiology

(1-0) Cr. 1. F.

An introduction to curriculum and research opportunities in microbiology at Iowa State. Topics include: easing the transition to life as a university student, development of specific goals, strengthening interpersonal communication, professional portfolio creation and resume building. Offered on a satisfactory-fail basis only.

#### MICRO 201: Introduction to Microbiology

(2-0) Cr. 2. F.S.

*Prereq: One semester of college-level biology*

Selected topics in microbiology with emphasis on the relationship of microorganisms to human and animal health, agricultural technology, and the environment. With written petition to the chair of the supervisory committee, students who obtain a grade of B or better may substitute 201 for Micro 302 in advanced courses.

#### MICRO 201L: Introductory Microbiology Laboratory

(0-3) Cr. 1. F.S.

*Prereq: Credit or enrollment in MICRO 201 or MICRO 302*

Basic microbiology laboratory techniques for non-microbiology majors. Credit for either Micro 201L or 302L, but not both, may be applied toward graduation.

#### MICRO 302: Biology of Microorganisms

(3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 211, credit or enrollment in BIOL 212; 1 semester of chemistry*

Basic cell biology, physiology, metabolism, genetics and ecology of microorganisms, with an emphasis on prokaryotes and viruses, as well as the roles of microorganisms in the environment, disease, agriculture, and industry.

#### MICRO 302L: Microbiology Laboratory

(0-3) Cr. 1. F.S.

*Prereq: Credit or enrollment in MICRO 302*

Basic microbiology laboratory techniques for majors in microbiology, biological sciences and related fields. Credit for either Micro 201L or 302L, but not both, may be applied toward graduation.

#### MICRO 310: Medical Microbiology

(3-0) Cr. 3. F.

*Prereq: MICRO 302 (or MICRO 201 if a B or better was obtained)*

Study of infection by bacterial and viral pathogenic agents of humans with an overview of immune responses in controlling disease.

#### MICRO 310L: Medical Microbiology Laboratory

(0-3) Cr. 1. F.

*Prereq: MICRO 201 or MICRO 302; MICRO 201L or MICRO 302L; credit or enrollment in MICRO 310*

Microbiological tools and techniques to isolate, identify, and characterize medically significant microorganisms in relation to human diseases. Emphasis on the virulence factors of pathogenic organisms as compared to the normal flora.

**MICRO 320: Molecular and Cellular Bacteriology**

(4-0) Cr. 4. S.

*Prereq: MICRO 302, BIOL 313, credit or enrollment in CHEM 332*

A systems perspective of bacterial growth, survival, and cellular differentiation by integrating physiological and genetic principles. Emphasis is on prokaryotes although unicellular eukaryotes are also discussed. Topics include the structure, function, and assembly of cell components, molecular and genomic techniques, bioenergetics and metabolism, regulation of gene expression, genetic adaptation, stress tolerance, biofilms, and cell-cell interactions and communications.

**MICRO 353: Introductory Parasitology**

(Cross-listed with BIOL, V PTH). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Biology and host-parasite relationships of major groups of animal parasites, and techniques of diagnosing and studying parasites.

**MICRO 374: Insects and Our Health**

(Cross-listed with ENT). (3-0) Cr. 3. S.

*Prereq: 3 credits in biological sciences*

Identification, biology, and significance of insects and arthropods that affect the health of humans and animals, particularly those that are vectors of disease.

Meets International Perspectives Requirement.

**MICRO 374L: Insects and Our Health Laboratory**

(Cross-listed with ENT). (0-3) Cr. 1. Alt. S., offered even-numbered years.

*Prereq: Credit or enrollment in ENT 374*

Laboratory and field techniques for studying medical or public health entomology, including: collection, identification and maintenance of medically significant arthropods and experimental design and execution related to the biology of arthropods or arthropod-pathogen interactions.

**MICRO 402: Microbial Genetics and Genomics**

(Dual-listed with MICRO 502). (Cross-listed with GEN). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: MICRO 302, Biol 313*

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

**MICRO 407: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with MICRO 507). (Cross-listed with FS HN). (3-0) Cr. 3. S.

*Prereq: MICRO 420*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program).

**MICRO 408: Virology**

(3-0) Cr. 3. F.

*Prereq: BIOL 313 or BBMB 301. BIOL 314 recommended*

The molecular virology and epidemiology of human, animal, plant and insect viruses.

**MICRO 410: Insect-Virus Interactions: a Molecular Perspective**

(Dual-listed with MICRO 510). (Cross-listed with ENT). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: Permission of an instructor.*

Overview of insect-virus interactions including insect immunity to viruses, genetic enhancement of viral insecticides, transgenic mosquitoes, disruption of virus transmission, and the role of insect and virus genomics in combating viral disease of both human and agricultural importance.

**MICRO 419: Foodborne Hazards**

(Cross-listed with FS HN, TOX). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MICRO 201 or MICRO 302, a course in biochemistry*

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards. Assessed service learning component. Only one of FS HN 419 and FS HN 519 may count toward graduation.

**MICRO 420: Food Microbiology**

(Cross-listed with FS HN, TOX). (3-0) Cr. 3. F.

*Prereq: MICRO 201 or MICRO 302*

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

**MICRO 421: Food Microbiology Laboratory**

(Cross-listed with FS HN). (0-6) Cr. 3. S.

*Prereq: MICRO 201 or MICRO 302; MICRO 201L or MICRO 302L. Credit or enrollment in FS HN/MICRO 420*

Standard techniques used for the microbiological examination of foods. Independent and group projects on student-generated questions in food microbiology. Emphasis on oral and written communication and group interaction.

**MICRO 430: Prokaryotic Diversity and Ecology**

(Dual-listed with MICRO 530). (Cross-listed with BBMB). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MICRO 302, MICRO 302L*

Survey of the diverse groups of prokaryotes emphasizing important and distinguishing metabolic, phylogenetic, morphological, and ecological features of members of those groups.

**MICRO 440: Laboratory in Microbial Physiology, Diversity, and Genetics**

(Cross-listed with BBMB). (2-6) Cr. 4. F.S.

*Prereq: MICRO 302, MICRO 302L, CHEM 332, BIOL 313L*

Fundamental techniques and theory for studying the cellular mechanisms, genetic processes and diversity of microbial life. Experimental techniques will include isolation and physiological characterization of bacteria that inhabit different environments as well as an emphasis on genetic and molecular techniques to understand antibiotic resistance processes and mechanisms. Also included are techniques for phylogenetic characterization, measuring gene expression, and genetic manipulation of bacteria. Essential components for the effective communication of scientific results are also emphasized.

**MICRO 450: Undergraduate Capstone Colloquium**

(2-0) Cr. 2. S.

*Prereq: SP CM 212 and senior standing in Microbiology*

Required of all undergraduate majors in microbiology. Students demonstrate mastery of core courses in microbiology through discussion of current literature in microbiology and immunology, issues in scientific conduct, and bioethics in microbiology. Students present current papers in a journal club format and gain experience in writing and reviewing grant proposals.

**MICRO 451: Senior Survey in Microbiology**

Cr. R. F.

*Prereq: Junior or Senior standing in Microbiology*

Preparations for graduation. Topics include job search strategies, career information, mock interviews, graduate and professional school application processes and guidelines as well as outcomes assessment activities.

**MICRO 456: Principles of Mycology**

(Cross-listed with BIOL). (2-3) Cr. 3. F.

*Prereq: 10 credits in biological sciences*

Morphology, diversity, and ecology of fungi; their relation to agriculture, industry, and human health.

**MICRO 475: Immunology**

(Dual-listed with MICRO 575). (3-0) Cr. 3. S.

*Prereq: MICRO 310*

An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease. Micro 475L optional. Credit for either Micro 475 or V MPM 520, but not both, may be applied to graduation.

**MICRO 475L: Immunology Laboratory**

(1-4) Cr. 1. S.

*Prereq: Credit or enrollment in MICRO 310 or MICRO 475 or MICRO 575*

Techniques in primary culture and tumor cell growth, measures of lymphocyte function, serological techniques and flow cytometry. Half semester course.

**MICRO 477: Bacterial-Plant Interactions**

(Dual-listed with MICRO 577). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in microbiology or plant pathology*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**MICRO 485: Soil and Environmental Microbiology**

(Dual-listed with MICRO 585). (Cross-listed with AGRON, ENSCI). (2-3) Cr. 3. F.

*Prereq: AGRON 182 or equivalent; MICRO 201 and MICRO 201L recommended*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues.

**MICRO 487: Microbial Ecology**

(Dual-listed with MICRO 587). (Cross-listed with BIOL, ENSCI, GEOL). (3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**MICRO 490: Independent Study**

Cr. 1-5. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: A minimum of 6 credits of 300-level or above coursework in microbiology, permission of instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490A: Independent Study: Laboratory Research**

Cr. arr. Repeatable. F.SS.

*Prereq: A minimum of 6 credits of 300-level or above coursework in microbiology, permission of instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490B: Independent Study: Literature Review**

Cr. arr. Repeatable. F.SS.

*Prereq: A minimum of 6 credits of 300-level or above coursework in microbiology, permission of instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490C: Independent Study: Instructional Assistant**

Cr. arr. Repeatable. F.SS.

*Prereq: A minimum of 6 credits of 300-level or above coursework in microbiology, permission of instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490G: Independent Study: General**

Cr. arr. Repeatable. F.SS.

*Prereq: A minimum of 6 credits of 300-level or above coursework in microbiology, permission of instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490H: Independent Study, Honors**

Cr. 1-5. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: A minimum of 6 credits of 300-level or above coursework in microbiology, permission of instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 495: Internship**

Cr. 1-2. F.S.

*Prereq: At least 6 credits of 300-level or above coursework in microbiology, approval of academic adviser*

Participation in the Cooperative Extension Intern Program or an equivalent work experience. Written report of activities required. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**MICRO 502: Microbial Genetics and Genomics**

(Dual-listed with MICRO 402). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: MICRO 302, Biol 313*

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

**MICRO 507: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with MICRO 407). (Cross-listed with FS HN). (3-0) Cr. 3. S.

*Prereq: MICRO 420*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program).

**MICRO 509: Plant Virology**

(Dual-listed with MICRO 509). (Cross-listed with PL P). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: BIOL 313 or BBMB 301. BIOL 314 recommended.*

Taxonomy, molecular mechanisms, host-interactions, vector transmission, epidemiology, detection, control and exploitation of plant viruses. Course will consist of a mixture of lectures, and student-led presentations using primary literature.

**MICRO 510: Insect-Virus Interactions: a Molecular Perspective**

(Dual-listed with MICRO 410). (Cross-listed with ENT). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: Permission of an instructor.*

Overview of insect-virus interactions including insect immunity to viruses, genetic enhancement of viral insecticides, transgenic mosquitoes, disruption of virus transmission, and the role of insect and virus genomics in combating viral disease of both human and agricultural importance.

**MICRO 525: Intestinal Microbiology**

(Cross-listed with V MPM). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Micro 302, BIOL 313*

Overview of commensal microbiota in the health and well-being of vertebrates. Topics include diversity of intestinal structure, microbial diversity/function, innate immune development, community interactions and metabolic diseases associated with alterations of the intestinal microbiome.

**MICRO 530: Prokaryotic Diversity and Ecology**

(Dual-listed with MICRO 430). (Cross-listed with BBMB). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MICRO 302, MICRO 302L*

Survey of the diverse groups of prokaryotes emphasizing important and distinguishing metabolic, phylogenetic, morphological, and ecological features of members of those groups.

**MICRO 540: Livestock Immunogenetics**

(Cross-listed with AN S, V MPM). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: AN S 561 or MICRO 575 or V MPM 520*

Basic concepts and contemporary topics in genetic regulation of livestock immune response and disease resistance.

**MICRO 551: Microbial Diversity and Phylogeny**

(1-0) Cr. 1. F.

*Prereq: MICRO 302, BIOL 313*

Comparisons among the three kingdoms of life (Bacteria, Archaea, and Eukarya). Topics will include metabolism, adaptation, methods of phylogenetic analysis, and comparative genomics.

**MICRO 552: Bacterial Molecular Genetics and Physiology**

(1-0) Cr. 1. F.

*Prereq: MICRO 302, BIOL 313*

Review of genetics and selected physiological topics of model bacteria.

**MICRO 553: Pathogenic Microorganisms**

(1-0) Cr. 1. F.

*Prereq: MICRO 302, BIOL 313*

Review and contrast/comparison of common bacterial pathogens of plants and animals and their mechanisms of virulence, including toxins, protein secretion, host invasion and iron acquisition strategies. An overview of eukaryotic cell biology that is relevant to pathogenesis will also be included.

**MICRO 554: Virology**

(1-0) Cr. 1. S.

*Prereq: MICRO 302, BIOL 313*

Introduction to virus life cycles including entry, gene expression strategies, replication, and mechanisms to modify and overcome host defenses. The roles of specific viruses and sub-viral agents in animal and plant disease will also be included.

**MICRO 555: Fungal Biology**

(1-0) Cr. 1. S.

*Prereq: GEN 313 or GEN 320 or equivalent.*

Ecology, genetics, physiology and diversity of fungi, from yeasts to mushrooms, and their importance in human affairs.

**MICRO 556: Ecology of Microorganisms**

(1-0) Cr. 1. S.

*Prereq: MICRO 302, BIOL 313*

The study of microorganisms in their natural environments, with a focus on terrestrial and aquatic ecosystems, including eukaryotic hosts; interactions within biofilms and communities, including intercellular communication and symbioses; microbial adaptations to extreme environments; and metagenomic, genomic, molecular and microscopy techniques for the study of microbes in natural systems.

**MICRO 575: Immunology**

(Dual-listed with MICRO 475). (Cross-listed with V MPM). (3-0) Cr. 3. S.

*Prereq: MICRO 310*

An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease. Micro 475L optional. Credit for either Micro 575 or V MPM 520, but not both, may be applied toward graduation.

**MICRO 577: Bacterial-Plant Interactions**

(Dual-listed with MICRO 477). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in microbiology or plant pathology*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**MICRO 585: Soil and Environmental Microbiology**

(Dual-listed with MICRO 485). (Cross-listed with AGRON, ENSCI). (2-3) Cr. 3. F.

*Prereq: AGRON 182 or equivalent; MICRO 201 and MICRO 201L recommended*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues.

**MICRO 586: Medical Bacteriology**

(Cross-listed with V MPM). (4-0) Cr. 4. F.

*Prereq: 310*

Bacteria associated with diseases of vertebrates, including virulence factors and interaction of host responses.

**MICRO 587: Microbial Ecology**

(Dual-listed with MICRO 487). (Cross-listed with EEOB, ENSCI, GEOL). (3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**MICRO 590: Special Topics**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

**Courses for graduate students:**

**MICRO 604: Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Course will expose students to the breadth of subdisciplines within microbiology, offer opportunities for direct interaction between the students and the faculty members within the Interdepartmental Microbiology Graduate Program, and promote interactions among the students within the program. Offered on a satisfactory-fail basis only.

**MICRO 608: Molecular Virology**

(Cross-listed with PL P, V MPM). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BBMB 405 or GDCB 511*

Advanced study of virus host-cell interactions. Molecular mechanisms of viral replication and pathogenesis.

**MICRO 615: Molecular Immunology**

(Cross-listed with BBMB, V MPM). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: BBMB 405 or BBMB 506 and BBMB 507*

Current topics in molecular aspects of immunology: T and B cell receptors; major histocompatibility complex; antibody structure; immunosuppressive drugs and viruses; and intracellular signaling pathways leading to expression of genes that control and activate immune function.

**MICRO 625: Mechanisms of Bacterial Pathogenesis**

(Cross-listed with V MPM). (4-0) Cr. 4. Alt. S., offered odd-numbered years.

*Prereq: Credit in Biochemistry and Microbiology*

Review of current concepts in specific areas of microbial pathogenesis including the genetic basis for bacterial disease, genetic regulation and control of virulence factors and their mechanisms of action, and host-pathogen interactions at the cellular and molecular levels. The application of microbial genetics to understanding pathogenesis will be included.

**MICRO 626: Advanced Food Microbiology**

(Cross-listed with FS HN, TOX). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Topics of current interest in food microbiology, including new foodborne pathogens, rapid identification methods, effect of food properties and new preservation techniques on microbial growth, and mode of action of antimicrobials.

**MICRO 627: Rapid Methods in Food Microbiology**

(Cross-listed with FS HN, TOX). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Provides an overview of rapid microbial detection methods for use in foods. Topics include historical aspects of rapid microbial detection, basic categories of rapid tests (phenotypic, genotypic, whole cell, etc.), existing commercial test formats and kits, automation in testing, sample preparation and "next generation" testing formats now in development.

**MICRO 685: Advanced Soil Biochemistry**

(Cross-listed with AGRON, ENSCI). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: AGRON 585*

Chemistry of soil organic matter and biochemical transformations brought about by microorganisms and enzymes in soils.

**MICRO 690: Current Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 690A: Current Topics: Microbiology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 690B: Current Topics: Immunology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 690C: Current Topics: Infectious Diseases**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 692: Molecular Biology of Plant-Pathogen Interactions**

(Cross-listed with PL P). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: PL P 506 or BBMB 405 or GEN 411 or MICRO 402 or strong background in molecular biology*

Seminal and current research in molecular and physiological aspects of plant interactions with pathogens, including mechanisms of pathogenesis, host-pathogen recognition and host defense, with an emphasis on critical evaluation of primary literature. Students also complete a research proposal writing and peer review exercise.

**MICRO 697: Graduate Research Rotation**

Cr. arr. Repeatable. F.S.

Graduate research projects performed under the supervision of selected faculty members in the Interdepartmental Microbiology major.

**MICRO 698: Seminar in Molecular, Cellular, and Developmental Biology**

(Cross-listed with BBMB, GDCB, MCDB, V MPM). (2-0) Cr. 1-2. Repeatable.

F.S.

Student and faculty presentations.

**MICRO 699: Research**

Cr. arr. Repeatable.

**Courses primarily for undergraduates:****PL P 408: Principles of Plant Pathology**

(Dual-listed with PL P 508). (2-2) Cr. 3. F.S.

*Prereq: 8 credits in life sciences, including BIOL 211 or 212.*

Braun. Principles underlying the nature, diagnosis, and management of plant diseases. Laboratory complements lecture topics and provides experience in plant disease diagnosis.

**PL P 416: Forest Insects and Diseases**

(Cross-listed with FOR). (3-0) Cr. 3. F.

*Prereq: 8 credits in biological sciences, including BIOL 211 or equivalent.*

Nature of insects and pathogens of forest and shade trees; their role in the dynamics of natural and managed forest ecosystems; and the management of indigenous and exotic pests.

**PL P 416L: Forest Insects and Diseases Laboratory**

(Cross-listed with FOR). (0-3) Cr. 1. F.

*Prereq: 8 credits in biological sciences, including BIOL 211 or equivalent.*

*Credit or enrollment in PL P 416.*

Laboratory experience working with insect and fungal pests of trees.

**PL P 452: Integrated Management of Diseases and Insect Pests of Turfgrasses**

(Dual-listed with PL P 552). (Cross-listed with ENT, HORT). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**PL P 477: Bacterial-Plant Interactions**

(Dual-listed with PL P 577). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in microbiology or plant pathology*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**PL P 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or senior classification, 7 credits in biological sciences, permission of instructor*

A maximum of 6 credits of PL P 490 may be used toward the total of 128 credits required for graduation.

**PL P 490A: Independent Study: Plant Pathology**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or senior classification, 7 credits in biological sciences, permission of instructor*

A maximum of 6 credits of PL P 490 may be used toward the total of 128 credits required for graduation.

**PL P 490H: Independent Study: Honors**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or senior classification, 7 credits in biological sciences, permission of instructor*

A maximum of 6 credits of PL P 490 may be used toward the total of 128 credits required for graduation.

**PL P 494: Seed Pathology**

(Dual-listed with PL P 594). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Significance of biotic and abiotic diseases that affect the production and utilization of seeds, during each phase of the seed life cycle: growing, harvesting, conditioning, storing, and planting seed. Mechanisms of seed infection and seed-to-seedling transmission are considered for fungi, bacteria, viruses/viroids, and nematodes. Aspects of epidemiology, management, and host-pathogen relationships are discussed. Emphases include the role of seed health testing in the global seed industry for quality control and phytosanitary certification, as well as the use of seed treatments to manage seedborne and soilborne pathogens and pests. Concurrent enrollment in PL P 494L/594L (Seed Pathology Laboratory) is strongly encouraged (on-campus students only). Credit may not be obtained for both PL P 494/594 and STB/PL P 592.

**PL P 494L: Seed Pathology Laboratory**

(Dual-listed with PL P 594L). (0-3) Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Laboratory in seed pathology. Seed health testing methods; effects of seed treatments and seed conditioning on seedborne pathogens.

**Courses primarily for graduate students, open to qualified undergraduates:**

**PL P 506: Plant-Pathogen Interactions**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416, BIOL 313*

Baum, Whitham. Introduction to mechanisms of plant-parasite interaction. Genetics and molecular genetics of plant disease resistance and pathogenicity.

**PL P 508: Principles of Plant Pathology**

(Dual-listed with PL P 408). (2-2) Cr. 3. F.S.

*Prereq: 8 credits in life sciences, including BIOL 211 or 212.*

Braun. Principles underlying the nature, diagnosis, and management of plant diseases. Laboratory complements lecture topics and provides experience in plant disease diagnosis.

**PL P 509: Plant Virology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: BIOL 313 or BBMB 301. BIOL 314 recommended.*

Taxonomy, molecular mechanisms, host-interactions, vector transmission, epidemiology, detection, control and exploitation of plant viruses. Course will consist of a mixture of lectures, and student-led presentations using primary literature.

**PL P 511: Integrated Management of Tropical Crops**

(Cross-listed with ENT, HORT). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416 or ENT 370 or ENT 376 or HORT 221*

Applications of Integrated Crop Management principles (including plant pathology, entomology, and horticulture) to tropical cropping systems. Familiarization with a variety of tropical agroecosystems and Costa Rican culture is followed by 10-day tour of Costa Rican agriculture during spring break, then writeup of individual projects. Meets International Perspectives Requirement.

**PL P 512: Lifestyles of plant pathogenic fungi and oomycetes.**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or MICRO 456 or equivalent.*

Exploration of the major groups of plant pathogenic fungi and oomycetes, focusing on the diseases they cause as well as pathogen ecology, diagnosis, crop resistance, and fungicide resistance.

**PL P 530: Ecologically Based Pest Management Strategies**

(Cross-listed with AGRON, ENT, SUSAG). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes.

**PL P 543: Ecology and Epidemiology of Plant Diseases**

(2-2) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416*

Nutter. Theory and practice related to the ecology and epidemiology of plant disease epidemics. Interactions among host and pathogen populations as affected by the environment are quantified with respect to time and space. Analysis of ecological and host and pathogen genetic factors that alter the course of plant disease epidemics. Risk assessment theory, disease forecasting, and modeling the impact of biotic plant stresses on yield and quality are also emphasized.



**PL P 552: Integrated Management of Diseases and Insect Pests of Turfgrasses**

(Dual-listed with PL P 452). (Cross-listed with ENT, HORT). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**PL P 574: Plant Nematology**

(2-0) Cr. 2. Alt. SS., offered odd-numbered years.

*Prereq: 8 credits in biological sciences, including BIOL 211 or equivalent*  
Morphology, anatomy, identification, management, and life cycles of common plant-parasitic nematodes; host-parasite interactions; recent advances in plant nematology.

**PL P 574L: Laboratory Techniques in Plant Nematology**

(0-3) Cr. 1. Alt. SS., offered odd-numbered years.

*Prereq: 8 credits in biological sciences, including BIOL 211 or equivalent.*  
*Must also be registered for PIP 574.*

Practical skills of sample collection, processing, extraction, and identification of plant-parasitic nematodes from soil and roots; other techniques will be discussed.

**PL P 577: Bacterial-Plant Interactions**

(Dual-listed with PL P 477). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in microbiology or plant pathology*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**PL P 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 10 credits in biological sciences, permission of instructor*

**PL P 592: Seed Health Management**

(Cross-listed with STB). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Admission to the Graduate Program in Seed Technology and Business/Consent of instructor*

Munkvold. Occurrence and management of diseases during seed production, harvest, conditioning, storage, and planting. Emphasis on epidemiology, disease management in the field, seed treatment, effects of conditioning on seed health, and seed health testing. Credit may not be obtained for both PI P/STB 592 and PI P 594.

**PL P 594: Seed Pathology**

(Dual-listed with PL P 494). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Significance of biotic and abiotic diseases that affect the production and utilization of seeds, during each phase of the seed life cycle: growing, harvesting, conditioning, storing, and planting seed. Mechanisms of seed infection and seed-to-seedling transmission are considered for fungi, bacteria, viruses/viroids, and nematodes. Aspects of epidemiology, management, and host-pathogen relationships are discussed. Emphases include the role of seed health testing in the global seed industry for quality control and phytosanitary certification, as well as the use of seed treatments to manage seedborne and soilborne pathogens and pests. Concurrent enrollment in PI P 494L/594L (Seed Pathology Laboratory) is strongly encouraged (on-campus students only). Credit may not be obtained for both PI P 494/594 and STB/PI P 592.

**PL P 594L: Seed Pathology Laboratory**

(Dual-listed with PL P 494L). (0-3) Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Laboratory in seed pathology. Seed health testing methods; effects of seed treatments and seed conditioning on seedborne pathogens.

**Courses for graduate students:****PL P 608: Molecular Virology**

(Cross-listed with MICRO, V MPM). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BBMB 405 or GDCB 511*

Advanced study of virus host-cell interactions. Molecular mechanisms of viral replication and pathogenesis.

**PL P 628: Improving Professional Presentation Skills**

(2-0) Cr. 2. F.

*Prereq: Graduate student status.*

Skill building to improve oral presentation fundamentals for graduate students in biological sciences. Principles and guidance in both personal speaking style and maximizing impact of presentation software. In-depth lectures and class discussions on all aspects of presentation skills. Video and anonymous peer review of individual speeches.

**PL P 691: Field Plant Pathology**

(0-6) Cr. 2. Repeatable. Alt. SS., offered even-numbered years.

*Prereq: PL P 408 or PL P 416*

Diagnosis of plant diseases, plant disease assessment methods, and the integration of disease management into commercial crop production practices. Objectives are to familiarize students with common diseases of Midwest crops and landscape plants, and to provide experience in disease diagnosis. Field trips include commercial operations, agricultural research facilities, and ornamental plantings.

**PL P 692: Molecular Biology of Plant-Pathogen Interactions**

(Cross-listed with MICRO). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: PL P 506 or BBMB 405 or GEN 411 or MICRO 402 or strong background in molecular biology*

Seminal and current research in molecular and physiological aspects of plant interactions with pathogens, including mechanisms of pathogenesis, host-pathogen recognition and host defense, with an emphasis on critical evaluation of primary literature. Students also complete a research proposal writing and peer review exercise.

**PL P 694: Colloquium in Plant Pathology**

(2-0) Cr. 2. Repeatable. S.

*Prereq: PL P 408 or PL P 416, permission of instructor*

Advanced topics in plant pathology, including biological control, cultural control, resistance gene deployment, genetic engineering for disease resistance, chemical control, integrated pest management, emerging diseases, fungal genetics, insect vector biology, professional communications, etc.

**PL P 698: Seminar**

Cr. 1. Repeatable. F.S.

**PL P 699: Thesis and Dissertation Research**

Cr. arr. Repeatable.

F.S.SS.