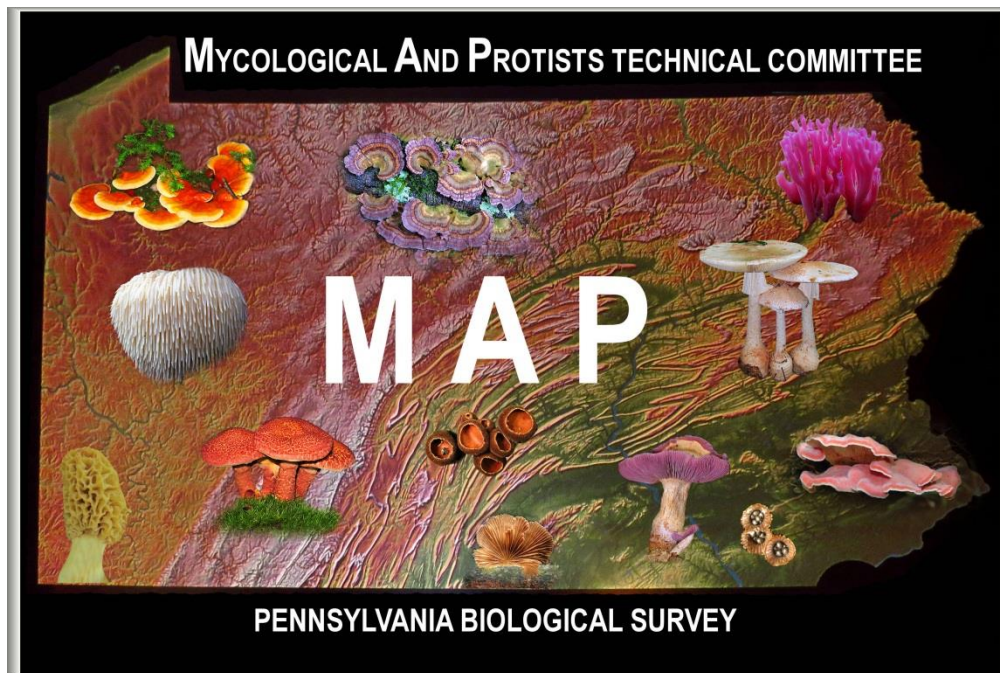


UNIVERSITY MYCO-RESOURCES

COMPILED IN 2022 AND 2023 BY JERRY HASSINGER TO SUPPORT THE OUTLINED STRATEGIES IN THE PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES DRAFT (1/6/2022) "FUNGI CONSERVATION WORK PLAN."

THESE STRATEGIES ARE THE INFORMAL BASIS FOR A FUTURE AND ONGOING WORKING RELATIONSHIP BETWEEN DCNR AND THE PENNSYLVANIA BIOLOGICAL SURVEY'S (PABS) MYCOLOGICAL AND PROTISTS TECHNICAL COMMITTEE (MAP-TC).

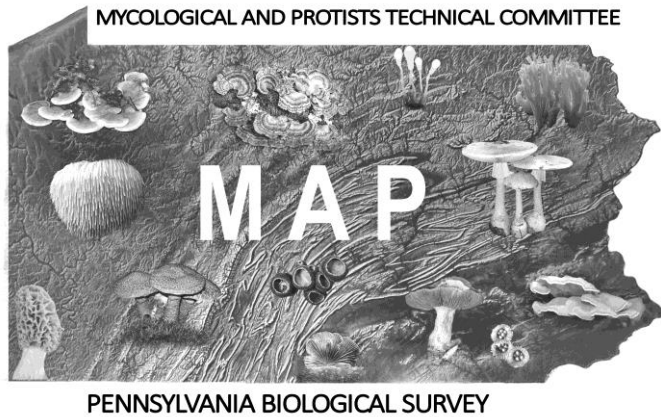
THIS COMPILATION WAS REVIEWED BY MEMBERS OF THE MAP-TC:
BARRIE OVERTON, DAVE WASILEWSKI, ELLA SERPELL, GARRETT TAYLOR. GREG PODNIESINSKI,
JAMES LENDEMER, JOHN PLISCHKE III, MARION KYDE, PETE WOODS, RICHARD JACOB,
ROGER LATHAM, SARAH MEISS, AND SCOTT STOLESON



MAP VISION: *FUNGI CONSERVATION INFORMED BY SCIENTIFIC DATA TO COMPLY WITH THE INTENT OF PENNSYLVANIA'S ENVIRONMENTAL AMENDMENT SECTION 27, ARTICLE 1, PENNSYLVANIA CONSTITUTION*

PART 2 MYCO-RESOURCES

MYCOLOGY COURSES AND RELATED HUMAN RESOURCES IN AND NEAR PENNSYLVANIA



A 2023 myco-resource availability survey by the PA Biological Survey's MAP TC

MAP TC Chair: Jerry Hassinger

MAP TC members: Richard Jacob, Ken Klemow, Marion Kyde, Roger Latham, James Lendemer, Barrie Overton, John Plischke III, Greg Podniesinski, Scott Stoleson, Ella Serpell, Garrett Taylor, Pete Woods

Following are the results of an informal and incomplete survey of the mycology course offerings by Universities in and near Pennsylvania. Also included are the names and email addresses of instructors, and course descriptions. When available or provided, a course syllabus is included.

Fungi are frequently treated, more or less, under the subject of microbiology and plant pathology; for the most part, these offerings are not included in this survey unless a course title specifically includes the words mycology or fungus.

Generally, whether or not a small University offers a mycology course seems to depend on the interest and expertise of one or two individuals. When those individuals retire or transfer, there's no attempt to replace them in kind, and mycology is no longer a part of the University's curriculum. In the course of this survey three Universities that did have a mycology course no longer offer mycology.

Not surprisingly the larger Universities have the most robust mycological programs; this includes: Penn State; SUNY-ESF NY; Cornell; Rutgers; and Ohio State University.

MYCOLOGY INSTRUCTORS IN AND NEAR PENNSYLVANIA

Compiled mARCH 2023, this listing is not complete. Additions are welcome.

Compiler: Jerry Hassinger jd.hass@yahoo.com

Chair Pennsylvania Biological Survey's Mycological and Protists Technical Committee

NAME	EMAIL ADDRESS	UNIV
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Dr. Barrie Overton	boverton@lockhaven.edu	Lock Haven Mansfield Bloomsburg PA
Dr. Benoit Dayrat	bad25@psu.edu	PSU PA
Dr. Bharathan Narayanaswamy	bharathn@iup.edu	IUP PA
Dr. Chris Smyth	csmyth@binghamton.edu smythmycology.com	SUNY Binghamton NY
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Dr. Daniel Panaccione	danpan@mail.wvu.edu	WVU WV
Dr. David Meigs Beyer	dmb8@psu.edu	PSU PA
Dr. David M. Geiser	dmg17@psu.edu	PSU PA

Dr. Greg Turner	gturner@wcupa.edu	West Chester PA
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Dr. Jason Evans	jvevans@mix.wvu.edu	WVU WV
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Dr. Kaoutar Mounadi	biology@kutztown.edu	Kutztown PA
Dr. Kathie T. Hodge	kh11@cornell.edu	Cornell NY
Dr. Laura Ramos-Sepulveda	laura.ramos-sepulveda@millersville.edu	Millersville PA
Dr. Leah Cook	lcc2@cornell.edu	Cornell NY
Dr. Lori. Huberman	<u>huberman@cornell.edu</u>	Cornell NY
Dr. María del Mar Jiménez Gasco	jimenez-gasco@psu.edu	PSU PA

Dr. Ning Zhang	zhang@sebs.rutgers.edu	Rutgers NJ
Dr. Sarah Meiss	meiss@pennwest.edu	Pennwest California PA
Dr. Sharifa Crandall	sgcrandall@psu.edu	PSU PA
Dr. Teresa Pawlowska	tep8@cornell.edu	Cornell NY
Dr. Thomas K. Mitchell	mitchell.815@osu.edu	OSU Ohio OH

MYCOLOGY COURSE OFFERINGS AND INSTRUCTORS	
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KUTZTOWN UNIVERSITY	11
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PENN STATE, COLLEGE OF AGRICULTURAL SCIENCES

DEPARTMENT OF PLANT PATHOLOGY AND ENVIRONMENTAL MICROBIOLOGY

State College, Pennsylvania

PPEM 120 THE FUNGAL JUNGAL

INSTRUCTORS

María del Mar Jiménez Gasco, Ph.D. *Interim Department Head, Plant Pathology and Environmental Microbiology*; **EMAIL** jimenez-gasco@psu.edu

Gretchen A. Kuldau, Ph.D. *Associate Professor* **EMAIL** kuldau@psu.edu

TEACHING IMPACT STATEMENT by Associate Professors María del Mar Jiménez Gasco, Ph.D., and Gretchen A. Kuldau, Ph.D.

The **FUNGAL JUNGLE** Inspires Students to Pursue Research Careers in Plant Pathology and Beyond

The general education course PPEM 120 "The Fungal Jungle: a Mycological Safari from Truffles to Slime Molds" has been named one of the most interesting undergraduate courses at Penn State by the electronic journal Onward State. Enrollment has steadily increased from nineteen students in 2014 to forty-two in 2022. One of the primary learning objectives is to provide students with a keen awareness of fungi in their lives. We have not yet systematically documented the influence of this course on the size of our minors and only have anecdotal evidence that this course serves as a gateway to the Plant Pathology and Mushroom Science and Technology minors. For example, former student Kristina Gans (B.S., 2015) was originally a Chemical Engineering major and changed her major to Biological Engineering with a minor in Plant Pathology. She is now a graduate student in Plant Pathology at Purdue University.



PENN STATE, COLLEGE OF AGRICULTURE SCIENCES

DEPARTMENT OF PLANT PATHOLOGY AND ENVIRONMENTAL MICROBIOLOGY

State College, Pennsylvania

COURSES: NUMEROUS RELATED TO PLANT PATHOLOGY AND MUSHROOM SCIENCE AND TECHNOLOGY.

Multiple Instructors (see : [Faculty — Department of Plant Pathology and Environmental Microbiology \(psu.edu\)](#))

The following faculty members specifically included the words mycology, mushrooms or fungi as one or more of their “Areas of Expertise:

David Meigs Beyer Ph.D. **EMAIL** dmb8@psu.edu
Sharifa Crandall Ph.D. **EMAIL** sgcrandall@psu.edu
David M. Geiser, Ph.D. **EMAIL** dmg17@psu.edu
Maria del Mar Jimenez Gasco, Ph.D. **EMAIL** jimenez-gasco@psu.edu
Gretchen A. Kuldau, Ph.D. **EMAIL** kuldau@psu.edu
John A. Pecchia, Ph.D. **EMAIL:** jap281@psu.edu

A MINOR IS OFFERED IN MUSHROOM SCIENCE AND TECHNOLOGY:

This interdisciplinary minor is designed to prepare students for a career in the mushroom industry. The minor offers practical work experience at the University’s Mushroom Research Center. Students are required to complete a minimum of 22 credits. The core of prescribed courses provides a foundation in the basic fundamentals of mushroom science and technology.

The Mushroom Science and Technology minor digs deep into the cultivation, health, and production of commercial varieties of mushrooms. Students work and study at the University’s state-of-the-art Mushroom Research Center.

Career paths: lead in the billion-dollar mushroom industry. Mushrooms are, quite literally, a growth industry. With America’s increasing fascination with high-quality food, mushroom demand has exploded, and Pennsylvania has taken the lead. A Mushroom Science and Technology minor can help you obtain a job where you contribute to the daily production, quality control, and food safety of mushrooms.

A Mushroom Science and Technology minor is a great option if you:

- are looking for a rewarding career in one of Pennsylvania’s leading agricultural industries
- love growing mushrooms and recognize their benefits to the ecosystem
- are a locavore who enjoys learning about the crops growing in your community



**PENN STATE, EBERLY COLLEGE OF SCIENCE
DEPARTMENT OF BIOLOGY
State College, Pennsylvania**

BIOL 484 BIODIVERSITY OF PENNSYLVANIA

INSTRUCTOR: Professor Benoit Dayrat EMAIL bad25@psu.edu

COURSE DESCRIPTION: In this course, students will study the species diversity of Pennsylvania. To understand the biodiversity that we see in Pennsylvania today, we will discuss the evolutionary, ecological, environmental, and historical factors that have shaped it. The course will also present the ecosystems of Pennsylvania, the major threats to biodiversity as well as the laws and programs in place for its protection. Students will explore the interconnections of all human activities (urbanization, industry, natural resources, agriculture, etc.) and biodiversity. Most weeks incorporate a field trip to allow students to explore local natural areas, and to study some of the species of organisms mentioned in lectures. This course satisfies the Evolutionary Biology category in the Biology major or the Practicum requirement as the course will incorporate 9-13 field trips throughout the semester.

LECTURE SCHEDULE: “Week 8, one lecture, Species Diversity in PA (fungi, lichens, algae)”



**PENN STATE, EBERLY COLLEGE OF SCIENCE
DEPARTMENT OF BIOLOGY
State College, Pennsylvania**

PPEM/BIOL 425 BIOLOGY OF FUNGI

INSTRUCTORS: Dr. David M. Geiser, EMAIL dmg17@psu.edu and Dr. Christina F. Call, EMAIL cfc74@psu.edu

COURSE DESCRIPTION: BIOL 425 / PPEM 425 (4 cr.) is a lecture and laboratory survey of the diversity of Fungi, consisting of two 75-minute lecture and two 180-minute laboratory/field activity periods per week. The course moves from branch to branch in the Fungal tree of life, covering aspects of ecology, morphology, physiology and life history, as well as current and historical importance to human affairs in medicine, agriculture and industry. Topics covered as students move through the Fungal tree include: 1) Macrofungi seen in the field; 2) Fungal evolution; 3) Fungal reproduction and dispersal; 4) Fungal growth, development and structure; 5) Fungal genetics and genomics; 6) Fungi as mutualistic symbionts of plants, animals and other organisms; 7) Fungal diseases of plants, animals and humans; 8) Fungi as toxin producers; 9) Fungi as sources of food, pharmaceuticals and enzymes; and 10) Fungi as research organisms used to understand basic biological processes. Some laboratory sessions consist of field trips to local forests to observe and collect Fungi for observation in the laboratory.

PENNWEST CALIFORNIA

California, Pennsylvania

DEPARTMENT OF BIOLOGY, GEOLOGY AND ENVIRONMENTAL SCIENCES

BIO 407 MYCOLOGY

INSTRUCTOR: Dr. Sarah Meiss **EMAIL** meiss@pennwest.edu

COURSE DESCRIPTION: A detailed examination of mushrooms, molds, and human mycoses, including an introduction to fungal ecology and assessment of fungal classification, as well as molecular systematics and an overview of medical significance. The course utilizes hands-on, student-driven, inquiry-based practices. Students will use scientific processes and procedures, data analysis, and research tools to investigate fungal morphogenesis, molecular diagnostics, culture techniques, ecological relationships, and human pathogenesis.

LOCK HAVEN, MANSFIELD & BLOOMSBURG UNIVERSITIES

Lock Haven, Mansfield and Bloomsburg, Pennsylvania

DEPARTMENT OF BIOLOGY

BIOL 431 AND 531 - MYCOLOGY

INSTRUCTOR Dr. Barrie Overton **EMAIL:**boverton@lockhaven.edu

COURSE DESCRIPTION: Investigations of mushrooms, molds, mycotoxins and human mycoses. This course introduces the student to fungal ecology, fungal classification, molecular systematics, and an overview of emerging animal and human pathogens. The course utilizes hands-on student-driven, inquiry-based practices. Students will use data analysis and research tools to investigate fungal morphogenesis; learn molecular diagnostics and culture techniques; and study ecological relationships of mushrooms inhabiting forest ecosystems.

This is an elective course for the BA/BS Biology and BS Biomedical Sciences degree programs. Mycology is required for many jobs working in ports, airports, and shipping yards for the Department of Homeland Security/Animal Plant Health Inspection Services. Fungi are emerging threats to animal and human health with the WHO just listing them as a severe threat to human health and indicated the need for new funds to investigate and mitigate this emerging threat. Fungi are important drivers in forest ecosystems and indicators of forest health and directly impact agricultural practices. Fungi cause wildlife and plant epidemics on large scales. A broad understanding of Mycology is needed for anyone going into Ecology or Biomedical studies.



INDIANA UNIVERSITY

Indiana, PA

BIOL 478 - MYCOLOGY AND PLANT PATHOLOGY

INSTRUCTOR: Bharathan Narayanaswamy EMAIL: bharathn@iup.edu

COURSE DESCRIPTION: Description: Introduces fungi as one of the most important plant pathogens. Provides a basis for comparative study of different groups of fungi. Studies basic biotic and abiotic causes of plant disease, the mechanisms by which these factors induce disease, the interactions between disease agents and their hosts, disease spread, prevention, and management and the human and environmental costs of plant diseases.



MILLERSVILLE UNIVERSITY

Millersville, PA

DEPARTMENT OF BIOLOGY

BIOL 424 - MYCOLOGY LAB

INSTRUCTORS:

- Dr. Laura Ramos-Sepulveda, EMAIL: laura.ramos-sepulveda@millersville.edu

COURSE DESCRIPTION: The taxonomy, morphology, physiology and ecology of fungi. Laboratory activities include surveys of local populations of fleshy fungi, fungal pathogens of

plants and soil fungi; physiological studies on growth and reproduction; experimental studies of fungal ecology; and studies of comparative morphology of diverse fungal groups.



KUTZTOWN UNIVERSITY

Kutztown, PA

**COLLEGE OF LIBERAL ARTS AND SCIENCE, BIOLOGICAL SCIENCES
DEPARTMENT OF BIOLOGICAL SCIENCES**

BIO 331 - MEDICAL MYCOLOGY

INSTRUCTOR: Kaoutar Mounadi **EMAIL:** biology@kutztown.edu

COURSE DESCRIPTION: This lecture and lab course offers students a unique opportunity to study fungi that cause diseases in humans. The course discusses taxonomy of fungi and the characteristics that make them successful and important human pathogens. The course also introduces students to major human fungal diseases, their etiology, diagnosis and treatment. The laboratory portion of the course consists of hands-on activities that include the isolation and identification of fungi by cultural and non-cultural methods and the study and testing of antifungal agents.



WEST CHESTER UNIVERSITY OF PENNSYLVANIA

West Chester, PA

DEPARTMENT OF BIOLOGY

BIO 454 - MYCOLOGY

INSTRUCTOR: Dr. Greg Turner **EMAIL:** gturner@wcupa.edu

COURSE DESCRIPTION: An introductory course including a general study of the biology of fungi and a survey of the field of medical mycology.

SUNY: BINGHAMTON UNIVERSITY

Binghamton, NY

BIOLOGICAL SCIENCES

BIOL 442 - FUNGI AND DISEASE

INSTRUCTOR: Dr. Chris Smyth EMAILS: csmyth@binghamto.edu and smythmycology.com

COURSE DESCRIPTION: This course will survey the diversity of fungi and fungal-like organisms, focusing on their taxonomy, biology, ecology, evolution, and relationship with humans. Students will explore fungi in both the laboratory and the field, with a hands-on approach centered around observing and collecting fungi, microscopic analysis, culturing fungi, as well as the molecular identification and phylogenetics. There will be several field trips to local forests to collect fungi for documentation and identification. Students will leave this course with a broad understanding of fungi, their diversity, and the skills to collect, culture and identify fungi using microbiological and molecular techniques.

SUNY-ESF

Syracuse, NY

COLLEGE OF ENVIRONMENTAL SCIENCE AND FORESTRY

MYCOLOGY AND FOREST PATHOLOGY

PARTICIPATING FACULTY

- William Powell, Professor and Director, Council on Biotechnology in Forestry
wapowell@esf.edu, 315-470-6761
Mycology and Forest Pathology

- Alexander Weir, Professor
aweir@esf.edu, 315-470-6761
Mycology and Forest Pathology

COURSE DESCRIPTION: The study of Mycology and Forest Pathology provides opportunity in a broad range of specialties fundamental to the understanding of fungi and their interaction with other organisms, and for specializations in forest pathology.

Graduate students in this program are provided with advanced preparation in the biology of fungi and in the concepts and practicalities of forest pathology. Current research interests include; taxonomy and systematics of fungi; mycorrhizal ecology; biology of parasites and symbionts; growth, developmental biology, and ultrastructure of fungi; disease resistance in trees; genetic engineering; plant-pathogen interactions; fungal phylogenetics; molecular ecology; biodiversity and conservation of fungi.

Students in this graduate area use a range of tools to address important questions pertaining to the above. Students work with their faculty advisor to develop research projects, often combining both laboratory and field work. Coursework requirements are developed with the major professor and steering committee and are tailored to individual student project and career goals.



CORNELL UNIVERSITY

Ithaca, NY

CORNELL CALS (College of Agriculture and Life Sciences)

School of Integrative Plant Science

Fungal Biology Minor

Fungi are important in making our planet work. They have profound impacts on biological systems as recyclers, nutrient prospectors, symbionts, pathogens, spoilage organisms, and sources of pharmaceuticals and other useful biochemicals. Cornell has no undergraduate major focusing entirely on mycology, but students in diverse fields can add a Minor in Fungal Biology that provides a deep knowledge of fungi and expands their versatility in the workplace.

The human, animal, and plant diseases caused by fungi are threats to global health. Serious fungal infections of humans are increasing at an alarming rate, in part due to a rise in numbers of immune-compromised individuals. Lately we've seen new diseases like white nose

syndrome of bats and the deadly frog chytrid—these and other emerging diseases are endangering animal species worldwide. Most plant diseases are caused by fungi, but they are increasingly difficult to manage with fungicides or conventional methods of breeding plants for resistance. We are increasingly aware of the acute and chronic impacts of mycotoxins in foods and indoor environments.

Despite their negative impacts, we are more aware than ever of the benefits of fungi. For thousands of years we've used fungi to make beer and wine and bread. Today, we brew ethanol for fuel and develop new foods, enzymes, and nutrients from the biochemical repertoires of fungi. Truffles are among the most expensive foods on earth because nobody has figured out a cost-effective way to cultivate them, but any of us can afford "ordinary" mushrooms for dinner. We now use symbiotic fungi to support forest and crop growth, and parasitic fungi to kill pests.

Cornell is one of few places in the United States where students can receive in-depth training on fungi and their impacts. Cornell's prominence in the field dates from the late 1800s and continues through today's genomics-enabled research. Students who add a Minor in Fungal Biology emerge understanding how fungi are studied with modern technologies; how they are dispersed and grow; how they can contribute or cause harm to health and ecosystem functioning; and how their growth can spoil our foods and other products before they come to market. The Fungal Biology Minor provides students with a broad introduction to fungi, their lifestyles and biology, and their roles in ecosystems and human affairs.

Requirements

Students complete two foundation courses listed below (five credits), plus at least six additional credits at the 2000-level or higher, for a minimum of 11 credits. **Credit for fungus-related courses not listed below requires the approval of the minor advisor.** Special topic courses, independent study, seminar courses, and courses without regular instruction cannot be counted toward the credit requirement without prior written approval of the minor advisor.

All courses must be taken for a letter grade and students must receive a grade of "C" or better for the course to count toward the minor. The Fungal Biology Minor especially complements majors in the health sciences, Biological Sciences, Biology and Society, Biological or Chemical Engineering, Microbiology, Plant Sciences, Food Science, Nutritional Sciences, Natural Resources, Entomology, Animal Sciences, Agricultural Sciences, and Viticulture and Enology.

How to Apply

1. Submit a copy of the [application form](#) and contact minor advisor [Kathie Hodge](#) to discuss your interests in fungal biology and decide which courses you will take to satisfy the minor.
2. Complete the required courses.

3. In your second-to-last semester, prior to pre-enrollment, meet with the minor advisor to determine if you have completed all requirements or if you need to take one or more classes your last semester.
4. After this meeting, email the Minor Coordinator, [Leah Cook](#), with a copy to the minor advisor, listing any courses you need to complete in your final semester.

A final grade audit will be completed a few weeks after graduation, and the minor will be added to your academic record at that time.

Foundation and Elective Courses

Two foundation courses are required of all students in the Fungal Biology Minor: To learn more about these courses, visit the [Courses of Study](#) website.

Required Foundation Courses (5 credits)

- PLPPM 3190 Mushrooms of Field and Forest (2 credits, Fall)
- PLPPM 4300 Mycology (3 credits, Fall)

In addition, students are required to take a **minimum of 6 credits** from the list below.

Elective Courses (6 credits)

Take a minimum of 6 credits from this list

- PLSCI 2010 Magical Mushrooms, Mischievous Molds (2 credits, Spring) *or* PLSCI 2013 Mushrooms, Molds, and More (3 credits, Spring)
- PLPPM 3010 Biology and Management of Plant Diseases (4 credits, Fall)
- PLPPM 6380 Filamentous Fungal Genetics and Genomics (3 credits, odd years)
- PLPPM 6490 Current Topics in Fungal Biology (1 credit, Fall) Exception to the no S/U rule
- PLSCI 2990/4990 *or* BIOG 2990/4990 Independent Undergraduate Research (fungus-related) (1-3 credits, Fall or Spring)
- FDSC 2206 Fermentation of Food (1 cr, 7 wks, Spring) +/- associated 0.5 credit lab
- VIEN 4650 Wine Microbiology (3 credits, Fall)

Special note about undergrad research experience:

Advice about Cornell labs for fungus-related **research** can be obtained from the Minor Advisor, who must give written approval that the research project qualifies for the Elective Courses requirement. A maximum of three credits of undergraduate research can be applied to Minor requirements, and *that research must be different from research required for your Major*.

Learning Outcomes

After completing the requirements of this concentration, student will be able to:

1. Understand the ecological roles and global impacts of fungi as:
 1. decomposers,
 2. mutualists of plants (endophytes, mycorrhizae, lichens) and animals (gut microbiota),
 3. pathogens of plants and animals,
 4. sources of food, antibiotics and other pharmaceuticals, and organic acids,
 5. allergens and producers of carcinogens and other toxins,
 6. model systems for biology
2. Describe the major groups of fungi and their life histories
3. Integrate evolutionary and reproductive biology to understand patterns and impacts of genetic variation in fungi.
4. Apply knowledge about fungal properties and diversity to solve real world challenges.
5. Sample fungi from the environment and apply genome- and morphology-based methods to identify them.
6. Critically read and synthesize research articles about fungi.
7. Speak the language of fungal biology and communicate about fungi to others

Contact Us

Prof. Kathie Hodge
401 Plant Science Bldg.

kh11@cornell.edu

607-255-5356

Leah Cook

135C Plant Science Bldg.

lcc2@cornell.edu

607-255-1257



CORNELL

**COLLEGE OF AGRICULTURE AND LIFE SCIENCES
FIELD OF PLANT PATHOLOGY AND PLANT-MICROBE BIOLOGY (PLPPM)**

INSTRUCTOR Dr. Kathie T. Hodge EMAIL: kh11@cornell.edu
HODGE LAB: SYSTEMATICS AND EVOLUTION OF FUNGI

FOUR COURSES:

PLPPM 2010 Magical Mushrooms, Mischievous Molds

PLPPM 3190 Mushrooms of Field and Forest

PLPPM 6490 Current Topics in Fungal Biology

PLPPM 3290 Medical and Veterinary Mycology (not currently offered)

I [Dr. Kathie T. Hodge] am an Associate Professor of Mycology in the Department of Plant Pathology & Plant-Microbe Biology at Cornell University. I teach **four classes**, do **research** on pathogenic fungi, and direct the **Cornell Plant Pathology Herbarium**. That keeps me pretty busy. Cornell is an exciting place to work. Fungi have been studied here since the late 1800s, so Cornell is very rich in mycology resources. However, despite over 120 years of mycology, new species and genera are still to be found in the Ithaca landscape. Work in my lab focuses on the systematics and ecology of fungi, especially insect pathogens and spoilage molds. We use modern molecular and classical morphological approaches to understand fungal relationships and make inferences about how they have evolved. We are good at alpha-taxonomy, the branch of systematics in which organisms are described for the first time, given names, and placed on their rightful branches in the tree of life. Although it's rare to find a new species or genus of mammal or bird these days, we think that over 90% of fungal species have never been described. There's a surprisingly vast and interesting taxonomic frontier in mycology.

COURSE DESCRIPTIONS

MAGICAL MUSHROOMS, MISCHIEVOUS MOLDS

INSTRUCTOR K. T. Hodge.

Presentation of the fungi and their roles in nature and in shaping past and present civilizations. Emphasizes the historical and practical significance of fungi as decayers of organic matter, as pathogens of plants and animals, as food, and as sources of mind-altering chemicals.

Outcome 1: Students will be able to describe with words and pictures the life cycle of a fungus from spore to spore, with appropriate terminology to distinguish sexual from asexual reproduction and environmental factors that affect each step in the cycle.

Outcome 2: Students will be able to explain the sequential events that led to current concepts of classification of fungi in the Tree of Life.

Outcome 3: Students will be able to relate the occurrence and/or spread of selected high

consequence plant diseases caused by fungi to the evolution of human cultures.

Outcome 4: Students will be able to make a reliable first assessment (without benefit of sophisticated tools or equipment) of the probability that a landscape tree poses a safety hazard to residents or passersby.

Outcome 5: Students will be able to identify six common edible mushrooms and four of the most deadly look-alikes.

Outcome 6: Students will be able to analyze a previously unseen problem related to the scope of fungal biology presented in the class and use that information to propose a means for resolving the problem.

[Magical Mushrooms website.](#)



MUSHROOMS OF FIELD AND FOREST

INSTRUCTOR K. T. Hodge.

COURSE DESCRIPTION: Students learn to identify mushrooms and other macrofungi we collect on a series of eight afternoon field trips to local forests. During evening labs, students practice identification skills, using keys and microscopes to observe and differentiate the diverse mushrooms we've collected. The course takes advantage of the peak Fall mushroom season in our region. Brief in-lab lectures introduce fungal diversity and the roles mushrooms play in Earth's ecosystems. Students must attend both lab times.

Outcome 1: Recognize a fungus when you see one.

Outcome 2: Distinguish a handful of common mushrooms in the field.

Outcome 3: Observe and describe in vivid detail the characteristics of any mushroom.

Outcome 4: Select an appropriate field guide or key, then integrate your observations to identify unknown mushrooms.

Outcome 5: Develop a collection of macrofungi from the local environment.

Outcome 6: Discuss the roles of fungi in the ecosystem.

Outcome 7: Be able to explain to others, convincingly, why fungi are cool.



CURRENT TOPICS IN FUNGAL BIOLOGY,

co-instructor: B.G. Turgeon **EMAIL:** bgt1@cornell.edu

COURSE DESCRIPTION Weekly discussion of current scientific articles on the biology of fungi. Primarily directed at graduate students, but undergraduates, postdocs, staff, and guests who have an interest in molecular and organismal biology of fungi are welcome.



CORNELL

IN ADDITION TO THE COURSES TAUGHT BY DR. KATHIE T. HODGE AND DR. B.G. TURGEON, THE FOLLOWING COURSES ARE ALSO OFFERED AT CORNELL:

PLPPM 4300 & 6300 - MYCOLOGY

INSTRUCTOR: Teresa Pawlowska **EMAIL:** tep8@cornell.edu.

COURSE DESCRIPTION: Fungi are one of the major lineages of eukaryotes and the sister group of animals. We will consider evolutionary relationships among different groups of fungi, their ecology and significance to humans. We will explore fungal lifestyles, their reproduction, and the ways that fungi use to communicate with each other and with their symbiotic partners. In addition to true fungi, we will study several distantly related groups of organisms that share with fungi absorptive nutrition, filamentous somatic structures, and spore-based reproduction. We will reconstruct fungal phylogenies using molecular evolution methods. We will also isolate fungi from the environment and identify them using morphological and molecular approaches.

Outcome 1: Familiarity with methods of phylogeny reconstruction for taxonomic identification of organisms.

Outcome 2: Ability to characterize major groups of fungi and their life histories.

Outcome 3: Familiarity with different fungal nutrition modes: saprotrophy, biotrophy, hemibiotrophy, and necrotrophy.

Outcome 4: Appreciation of the links between fungal lifestyle and reproductive biology,

i.e. loss of sex in mutualists vs. importance of recombination in parasites.

Outcome 5: Understanding principles that regulate fungal mating versus vegetative compatibility.

Outcome 6: Appreciation for the roles of fungi as: decomposers, mutualists of plants (endophytes, mycorrhizae, lichens) and animals (gut microbiota), pathogens of plants and animals, model systems for biology, sources of food, antibiotics, organic acids, allergens, toxins and carcinogens.



PLPPM 6490 - CURRENT TOPICS IN FUNGAL BIOLOGY

INSTRUCTORS: Lori. Huberman, **EMAIL:** huberman@cornell.edu & Gillian Turgeon., **EMAIL:** bgt1@cornell.edu

COURSE DESCRIPTION: Weekly discussion of current scientific articles on the biology of fungi. Primarily directed at graduate students, but undergraduates, postdocs, staff, and guests who have an interest in molecular and organismal biology of fungi are welcome.

Outcome 1: Outcome 1: Explain, evaluate, and effectively interpret factual claims, theories, and assumptions in the current literature of fungal biology.

Outcome 2: Outcome 2: Synthesize and present components of scientific arguments and evaluate them in the context of the current academic publishing environment.

Outcome 3: Outcome 3: Integrate quantitative and qualitative information to reach defensible conclusions and compare them to those presented in the scientific literature.

Outcome 4: Outcome 4: Communicate effectively with their peers to build group understanding.



PLPPM 6380 - FILAMENTOUS FUNGAL GENETICS AND GENOMICS

INSTRUCTORS: K. Bushley, **EMAIL:** keb45@cornell.edu ; L. Huberman, **EMAIL:** huberman@cornell.edu ; G. Turgeon, **EMAIL:** bgt1@cornell.edu

COURSE DESCRIPTION: Fungi play a vital role in our ecosystem and are responsible for devastating crop infestations that threaten global food supplies and diseases that result in the death of hundreds of thousands of individuals each year. This course explores fungal biology through the lens of molecular genetics and genomics, including epigenetics, genome defense mechanisms, metabolism, and signaling pathways. We will cover the use of genetic tools in fungi ranging from classical genetics to CRISPR to high-throughput sequencing. This course will also teach skills necessary to analyze genetic and genomic data using Python and publicly available sequencing analysis software. No prior coding experience is necessary. The course will

emphasize the development of professional skills, such as critically reading and reviewing scientific literature, experimental design, scientific communication, and data analysis. Students will write and peer review manuscripts based on the analysis of transcriptional profiling of fungi. Classes will include lectures, student-led discussion of the primary literature, presentations, and computer labs. A laptop is necessary for this course.

Outcome 1: Articulate the beneficial and harmful biological roles fungi play in the ecosystem.

Outcome 2: Explain the genetic and genomic principles governing fungi.

Outcome 3: Evaluate research papers from the current and historical literature on fungal genetics and genomics.

Outcome 4: Use Python and publicly available sequencing analysis programs to analyze transcriptomic data.



RUTGERS UNIVERSITY, THE STATE UNIVERSITY OF NEW JERSEY

New Brunswick, NJ

**RUTGERS SCHOOL OF ENVIRONMENTAL AND BIOLOGICAL SCIENCES
PLANT BIOLOGY DEPARTMENT; RUTGERS ECOLOGICAL PRESERVE**

E11:776:257 - EDIBLE AND POISONOUS FUNGI

INSTRUCTOR: Dr. James White **EMAIL:** james.f.white@rutgers.edu

COURSE DESCRIPTION: This course focuses on macroscopic and other fungi of economic importance and is designed for all majors with an emphasis on cultural impacts of fungi. Open to all majors, this is a great course for anyone interested in learning more about fungi and, mushrooms. Students will learn how to identify fungi, eat, cook with, make dyes, make paper and of course dying from eating the wrong mushrooms. There is a rotation of guest lectures with expertise in fungi history and products each year. There is a fun creative project where students have the opportunity to make a portfolio of fungi. Some students have written poems, songs, and various forms of art. Also see: **Rutgers Appendix 1**



11:776:400 - FUNGI IN THE ENVIRONMENT (Fall)

INSTRUCTORS: Dr. James White **EMAIL:** james.f.white@rutgers.edu & Dr. John Dighton **EMAIL:** dighton@camden.rutgers.edu

COURSE DESCRIPTION: This course provides an introduction to the fungal kingdom through fungal taxonomy and ecological function through lecture, a limited number of laboratory sections, and an individual fungal collection. The role of fungi in ecosystem processes and interactions with humans as food, diseases, medicinal products, and environmental pollution are emphasized. All students are involved in a group project to investigate an area of mycology that is of interest to them.

Designed for science majors, many students come from: food science, biology, plant science, evolutionary ecology majors. Course covers early classification and characteristics of fungi, part of the class is dedicated to the ecology of fungi – its niche behavior and the way they work – various functions of fungi in environment. Students get hands on experience through several labs that take the place of lectures. There is a collection requirement where students to go out and collect fungi and learn to identify them. Students are introduced to fungal identification through microscopy. There are also group projects where research is done on a fungal topic of interest through the library or from qualified references on-line. Students will write a paper and give an oral presentation. Also see: **Rutgers Appendix 1**

**16:765:533 - ADVANCED MYCOLOGY (Spring)**

INSTRUCTORS: Dr. John Dighton **EMAIL:** dighton@camden.rutgers.edu
 Dr. Ning Zhang **EMAIL:** zhang@sebs.rutgers.edu
 Dr. Joan W. Bennett: **EMAIL:** profmycogirl@yahoo.com

COURSE DESCRIPTION: Taking the Fungi in the Environment course one step further, students have to isolate and identify 20 different fungi. Students will learn how to grow fungi, isolate, and how to encourage sporulation through the use of different media. The majority of the identification is morphological identification through microscopy and various literature resources. Students will also have the opportunity to extract DNA from fungi and learn how to identify it through use of DNA sequence data.



FUNGI AND HUMAN HEALTH 11:776:415:01 (undergraduate) or 11:776:515:01 (graduate)

SPRING 2023 RUTGERS UNIVERSITY

INSTRUCTORS: Dr. Joan W. Bennett: EMAIL: profmycogirl@yahoo.com
 Dr. James White EMAIL: jwhite@aesop.rutgers.edu
 Dr. Ning Zhang EMAIL: zhang@sebs.rutgers.edu

COURSE DESCRIPTION: This course is intended for advanced undergraduates and graduate students across Rutgers University who will benefit from learning about the impact of fungi on human health, nutrition, and drug discovery. The course may be of interest to students involved in the study of food science and nutrition; animal and health sciences; microbiology; natural products; pharmacology; and plant pathology. Prerequisites: Two semesters of General Biology or equivalent.

COURSE SYLLABUS:

GRADING: (undergraduates)

Midterm exam	30%
Comprehensive final exam	40%
Special project	20%
Class attendance/participation	10%
Total	100%

Examinations will be based on subject matter covered in class. PowerPoint slides will be posted to *Canvas* and most slides will have URLs so that you can find the different internet sites and find out more about the various topics that are covered in class. You are expected to learn the technical terms **given in red on PowerPoint slides.**

Special project: The special project is open-ended and subject to instructor approval. Students will be divided into groups. Each group should choose a topic that will give them some hands-on experience and then be prepared to present a focused presentation in class with demonstration materials. For example, if you are interested in medicinal substances from fungi, your group could collect, grow, or purchase a representative species and bring it to class so that the rest of the class can see and touch it in real life rather than interpreted through a screen.

Then you will give a brief PowerPoint presentation. The same groups will be used for the mycophagy class.

Graduate students: Students taking the course for graduate credit will be required to write an individual term paper to supplement the group classroom presentation. In addition, graduate students may be assigned extra readings and/or participate in group discussions on these readings.

Attendance will be taken. If you miss more than two classes, it will have a negative impact on your grade. Most of the exam material will be covered in class so it is important to attend.

Schedule of classes:

Jan 17	<i>Introduction – “meet and greet”</i>
Jan 19	NO CLASS
Jan 24	1. What are fungi?
Jan 26	2. Introduction to nomenclature and taxonomy
Jan 31	3. Former fungi. What is a pathogen?
Feb 2	4. Mycoses: history, concepts, classification <i>(Divide class into groups for projects)</i>
Feb 7	Groups meet to discuss special project and mycophagy class.
Feb. 9	5. Mycoses: superficial and subcutaneous
Feb. 14	6. Mycoses: dimorphism
Feb 16	7. Mycoses: systemic and other <i>Special project topics due</i>
Feb 21	8. Antifungal drugs
Feb 23	9. Fungi as food: “mycophagy”
Feb 28	10. Fungi in food and drink – fermentations
March 1	11. Fungi and food safety: spoilage and introduction to mycotoxins
March 7	<i>Members of class to bring in fungal foods – give explanation about, have ‘dinner’ together (Joan Bennett will bring a mushroom cake for dessert). Location: Foran 138A</i>
March 9	Midterm examination
March 14	<i>Spring recess</i>
March 16	<i>Spring recess</i>

March 21	12. Fungal toxicology: mycotoxins
March 23	13 Fungal toxicology: mushroom poisons
March 28	14. Indoor air quality and “sick building syndrome”
March 30	15. Fungi as pharmaceuticals: traditional medicine, antibiotics
April 4	16. Fungi as pharmaceuticals: statins and immune suppressants
April 6	17. The genus Amanita – Dr. Rod Tulloss
April 11	18. <i>Cryptococcus</i> and its treatment – Dr. Chaoyang Xue
April 13	19. Allergies and asthma – Dr. Robert Laumbach
April 18	20. Hallucinogenic fungi and hallucinogens– Ms. Linsey Park
April 20.	21. Fungi and human cultures – Dr. James White
April 25	<i>Presentation of student projects</i>
April 27	<i>Presentation of student projects</i>

Final exam: To be announced (sometime between May 4-10)

LEARNING OBJECTIVES:

- To obtain a basic understanding of the fungi that impact human health in a positive or negative way
- To learn specialized vocabulary in medical mycology
- To integrate an understanding of fungi into other realms of biology and the health sciences
- To formulate information about fungi into new understanding of general topics in the health sciences and cognate disciplines
- To gain some hands-on experience with fungi through collecting, cultivating or otherwise using macro or microfungi.
- To apply information about fungi to everyday life

COURSE MATERIALS:

PowerPoint lectures: Lectures will be posted on Canvas after class. **Technical vocabulary marked in red on slides should be part of your working vocabulary for the course (“Yes, it will be on the exam.”).** By accessing the URLs on the slides, you can learn more about the source material.

Optional Readings: Several mycology textbooks, as well as other books on medical mycology, medical fungi, mushroom cultivation, and related fungal topics, will be available in Foran 295 (the break room on the second floor, also called “The Z Lounge”) for students who are interested.

THE OHIO STATE UNIVERSITY,

Columbus, Ohio

COLLEGE OF FOOD, AGRICULTURAL AND ENVIRONMENTAL SCIENCES

DEPARTMENT OF PLANT PATHOLOGY

MYCOLOGY MINOR

Dr. Jason Slot, Coordinator

Food, Agricultural, and Environmental Sciences

EMAIL: slot.1@osu.edu

The Minor in Mycology is designed to provide essential knowledge and training for careers where fungi are major players. For example, fungi are important in microbiology/healthcare, agriculture and plant disease management, ecology and forestry, fermentation/brewing and food science. The Minor in Mycology is also valuable to students interested in multiple areas of biology and chemistry research, including natural products discovery and synthetic biology. The Minor in Mycology is open to all students with introductory training in biology. Students pursuing the Minor in Mycology are required to take Plant Pathology 5040 and 5041 – Science of Fungi: Mycology Lecture and Lab – to develop a foundational understanding of fungal biology, diversity, and ecology.

Upon completion of Plant Path 5040 and 5041, students must take one course that deals with a major field of Mycological study from Plant Pathogenic Fungi (Plant Path 5050), Eukaryotic Pathogens, a course encompassing medical mycology (Microbiology 5147), and Food Fermentations (Food Science 5430). Additional courses in plant pathology, microbiology, and food science are available as elective coursework

A minor in Mycology consists of 12-14 credit hours selected as follows:

Required Courses (2 courses; 4 hours): Credit Hours

PLNTPTH 5040: Science of Fungi: Mycology Lecture 3

PLNTPTH 5041: Science of Fungi: Mycology Lab 1

Select at least one of the following courses (3 credit hours)

PLNTPTH 5050: Plant Pathogenic Fungi 3

MICROBIO 5147: Eukaryotic Pathogens 2 3

FDSCTE 5430: Food Fermentations 3 3

Electives: Select two to three of the following courses (5-7 credit hours)

PLNTPTH 2000: Molds, Mushrooms and Man 3

MICROBIO 2100: Wild Yeast: Isolation to Fermentation⁴ 3
 FDSCTE 2410: Brewing Science⁴ 2
 PLNTPTH 3001: General Plant Pathology Lecture¹ 3
 PLNTPTH 3333: Field and Woodland Fungi 2
 PLNTPTH 3920: Psychedelic Studies: Neurochemistry, Plants, Fungi, and Society 3
 PLNTPTH 4998: Undergraduate Research⁵ 1-3
 SENR 4998: Undergraduate Research⁵ 1-3
 MICROBIO 4998(H): Undergraduate Research⁵ 1-3
 EEOB 4998(H): Undergraduate Research⁵ 1-3
 EEOB 5798 & EEOB 3193: Tropical Behav. Ecol. & Evol. (with approved mycology focus) 4
 PLNTPTH 5050: Plant Pathogenic Fungi (If not taken above) 3
 MICROBIO 5147: Medical Mycology² (If not taken above) 3
 FDSCTE 5430: Food Fermentations³ (If not taken above) 3

TOTAL credit hours for minor in mycology: 12-14



PLNTPTH 5040 & 5041 - SCIENCE OF FUNGI: MYCOLOGY LECTURE

INSTRUCTORS: Jason Slot **EMAIL:** slot.1@osu.edu & Dr. Roth **EMAIL:** Roth.741@osu.edu

COURSE DESCRIPTION: Fungi are critical players in nearly all ecosystems on Earth. The particular biological features of fungi make them well adapted to a variety of ecological roles including as decomposers, mutualistic partners, and devastating pathogens of plants and animals. This course examines the diversity, biology and genetics of fungi with additional attention paid to their impacts in medicine, industry, environmental stewardship, and human culture.

By the end of **5040**, students should successfully be able to:

- **Learning goal 1:** Understand the principles of fungal growth, reproduction, and nutrient acquisition.
- **Learning goal 2:** Understand the diversity and evolutionary history of major fungal lineages.
- **Learning goal 3:** Understand the ecology and pathology of fungi, and their roles in natural and agricultural ecosystems.
- **Learning goal 4:** Understand the importance of fungi to human culture, society, and technological advances.

By the end of **5041**, students should successfully be able to:

- **Learning goal 1:** Demonstrate methods of working with fungi, including isolation, culture, quantification, and preparation for microscopy.
- **Learning goal 2:** Be familiar with fungal species in the environment through their microscopic and macroscopic features.
- **Learning goal 3:** Conduct basic mycological research.



PLNTPH 5050 - PLANT PATHOGENIC FUNGI

INSTRUCTOR: Mitchell Roth **EMAIL:** roth.741@osu.edu

COURSE DESCRIPTION: Plant pathogenic fungi are the cause of some of the most devastating plant diseases. These microorganisms are responsible for hundreds of billions of dollars in crop losses each year and are the number one threat to food security. They are also the largest and most diverse groups of pathogens that infect plants. Their diversity makes them some of the most interesting organisms on the planet, but also makes the study of the diseases they cause complex. This course is designed to provide a more in-depth look at these filamentous plant pathogens to better prepare graduate students planning on constructing careers in plant pathology. This course will cover the different groups of fungal pathogens with examples, their biology, and their impact on society both historically and currently. The course further explores current cutting edge topics in the primary literature.

By the end of this course, students should successfully be able to:

- **Learning goal 1:** Understand the characteristics that set fungi apart from other life forms.
- **Learning goal 2:** Learn about the different fungal pathogens of plants, how they infect, their impact, and their control.
- **Learning goal 3:** Understand the basic tenets of fungal biology, physiology, and genetics.

PLNTPH 3333 - FIELD AND WOODLAND FUNGI

INSTRUCTOR: Mitchell Roth **EMAIL:** roth.741@osu.edu

COURSE DESCRIPTION: Mushrooms and other macroscopic fungi are major features of forest, rural, and urban landscapes, yet few people are able to identify them. This is important because while many mushrooms are used as food, some can cause illness and death from their consumption, and are of interest/concern for many other economic and

ecological reasons. This course will give general and technical knowledge on the identification and ecology of macrofungi of Ohio. The course will involve hands-on experience in the field and lab and will include recorded lectures/interviews by OSU faculty and guest mycologists, along with technical instruction by highly skilled amateur mycologists.

By the end of this course, students should successfully be able to:

- **Learning goal 1:** Understand the basic differences among organisms in the kingdom fungi and their roles in the environment.
- **Learning goal 2:** Apply knowledge gained from Learning Goal 1 to further inform the public about the fungi we experience in our day-to-day lives



PLNTPH 2000 - MOLDS, MUSHROOMS, AND MANKIND

INSTRUCTOR: DR. Brian Pace **EMAIL:** pace.115@osu.edu

COURSE DESCRIPTION: Fungi have influenced human health, migration, and nutrition for thousands of years. This course studies fungal biology and the impact of fungi in society both historically and currently.

By the end of this course, students should successfully be able to:

- **Learning goal 1:** Describe the characteristics that set fungi apart from other life forms.
- **Learning goal 2:** Understand the impact fungi have on mankind in both a contemporary and historical context.



MICRO 5147 - EUKARYOTIC PATHOGENS

INSTRUCTOR: Chad Rappleye **EMAIL:** rappleye.1@osu.edu

COURSE DESCRIPTION: This course will discuss the major eukaryotic pathogens of medical importance with a primary emphasis on unicellular fungal and parasite pathogens that cause disease in humans. The course will focus on molecular mechanisms of pathogenesis, pathogen modulation of the host immune response, and diagnostics/therapeutics development. Although some background in immunology is helpful, such is not a pre-

requisite. We will cover essential immunological principles in the first weeks of class. There is no textbook for the class, but books on immunology and microbial pathogens will be placed on reserve at the library for students desiring additional material. As this is an upper division class, we will emphasize and discuss experimental data from scientific literature, including critical evaluation of primary data and an understanding of the implications of the results. Student participation during class discussions is expected.



WEST VIRGINIA UNIVERSITY

DAVIS COLLEGE OF AGRICULTURE

NATURAL RESOURCES AND DESIGN

DEPARTMENT OF PATHOLOGY, ANATOMY AND LABORATORY MEDICINE

PALM 350 & 554 - CLINICAL MYCOLOGY & PARASITOLOGY.

INSTRUCTOR: Jason Evans **EMAIL:** jvevans@mix.wvu.edu

COURSE DESCRIPTION: Study of clinically significant fungi and parasites that will include the morphological characteristics, pathogenicity, epidemiological characteristics, and laboratory testing.



PPTH 503 & 503L - MYCOLOGY

INSTRUCTOR: Daniel Panaccione **EMAIL:** danpan@mail.wvu.edu

COURSE DESCRIPTION: Lectures and field and laboratory studies of parasitic and saprophytic fungi



PPTH 730 - PHYSIOLOGY OF FUNGI

INSTRUCTOR: Daniel Panaccione **EMAIL:** danpan@mail.wvu.edu

COURSE DESCRIPTION: Study the physiological aspects of growth, reproduction, and parasitism of fungi, with emphasis on nutrition, environmental, and other biotic factors.

APPENDIX 1: RUTGERS

EDIBLE AND POISONOUS FUNGI

11:776:257 (1 credits)

Fall Semester (yearly)

CONTACT INFORMATION

Instructor: Dr. James White

Office Location: 294A Foran Hall, 59 Dudley Rd., New Brunswick, NJ 08901

Phone: 848-932-6286

E-mail: james.f.white@rutgers.edu

Office Hours: by arrangement

COURSE DESCRIPTION

This course focuses on macroscopic and other fungi of economic importance and is designed for all majors with an emphasis on cultural impacts of fungi.

COURSE WEBSITE, RESOURCES AND MATERIALS

- Course website: Canvas
- Supplemental materials:
 - o Any illustrated mushroom guide
 - o Other materials will be posted to Sakai

PREREQUISITE: None

COURSE LEARNING GOALS (link to Plant Biology Undergraduate Program Goals:
(<http://plantbiology.rutgers.edu/undergrad/plantbiology/>)

By the end of this course, the student will be able to:

1. Recognize features of the major groups of mushrooms (addresses program goal 1)
2. Describe specific edible and poisonous mushrooms (addresses program goal 1)
3. Describe how fungi have been used in human cultures (addresses program goals 1 and 2)

LECTURES:

- 1 What are fungi?

- 2 How fungi grow and reproduce
- 3 Mushroom identification
- 4 Ascomycete diversity
- 5 Mushroom paper
- 6 Cryptic microbes
- 7 Edible and poisonous mushrooms
- 8 Slime molds
- 9 Ethnomycology
- 10 Early history of mycology
- 11 Mycophagy: the cooking and eating of wild mushrooms
- 12 Lichens
- 13 Thanksgiving recess
- 14 Fungi and human cultures
- Review
- Final exam
- 15 Last day to submit projects

FUNGI IN THE ENVIRONMENT

11:776:400 (3 credits)

Fall Semester (yearly)

CONTACT INFORMATION

Instructor: Dr. James White

Office Location: 294A Foran Hall, 59 Dudley Rd., New Brunswick, NJ 08901

Phone: 848-932-6286

E-mail: james.f.white@rutgers.edu

Office Hours: by e-mail appointment

Instructor: Dr. John Dighton

Office Location: Room 201A, 315 Penn St., Camden NJ 08102

Phone: 609-894-8849

E-mail: dighton@camden.rutgers.edu

Office Hours: by e-mail appointment

COURSE DESCRIPTION

This course provides an introduction to the fungal kingdom through fungal taxonomy and ecological function through lecture, a limited number of laboratory sections, and an individual fungal collection. The role of fungi in ecosystem processes and interactions with humans as food, diseases, medicinal products, and environmental pollution are emphasized. All students are involved in a group project to investigate an area of mycology that is of interest to them.

COURSE WEBSITE, RESOURCES AND MATERIALS

- Course website: Sakai

- Required texts:
- Hudler GW. 2000. *Magical Mushrooms, Mischievous Molds*. Princeton University Press
- Kendrick B. 2001. *The Fifth Kingdom*, 3rd. Focus

PREREQUISITE: 01:119:115 General Biology OR 01:119:103 Principles of Biology

COURSE LEARNING GOALS

(Link to Plant Biology Undergraduate Program Goals:

<http://plantbiology.rutgers.edu/undergrad/plantbiology/>)

By the end of this course, the student will be able to:

1. Demonstrate a basic knowledge of fungal taxonomy (addresses program goal 1)
2. Demonstrate a basic knowledge of the functional diversity of fungi (addresses program goals 1 and 2)
3. To link the diversity of fungal functionality to ecosystem processes (addresses program goal 2)
4. To link fungal diversity to medicine, diseases, industrial processes, food production, and environmental pollution (addresses program goal 2)
5. To improve the capacity to communicate in oral and written forms (addresses program goal 3)

ASSIGNMENTS/RESPONSIBILITIES AND ASSESSMENT

Grading (390 points)

- Group project oral report 20 points
- Group project written report 50 points
- In-class exams (3 at 100 points each) 300 points
- Fungal collection (20 specimens at 1 point each) 20 points

Grades will be classified based on Rutgers approved system: A, B+, B, C+, C, D, and F (10-point scale).

Learning goals assessment:

- Quizzes to assess understanding of course material (course learning goals 1 to 4)
- Written exams to understand the linkages between elements learned in each class (course learning goals 3 and 4)
- A fungal collection with putative identification to understand fungal taxonomy (course learning goal 1)
- A research project to collaborate with others in a group to investigate in detail an aspect of mycology and hypothesis generation (course learning goal 5)

The percentage score on these assessments will determine the level of mastery: >90% outstanding; 80-89% good; 70-79% satisfactory; <69% unsatisfactory.

PARTICIPATION GRADE AND ABSENCE POLICY

Students are expected to attend all classes. Students who expect to miss one or two classes may use the University absence reporting website (<https://sims.rutgers.edu/ssra/>) to indicate the date and reason for the absence. An e-mail is automatically sent to the instructor.

COURSE SCHEDULE

Lecture Topic

- 1 Introduction-background and context (White; Hudler chapter 1)
 - 2 Fungal structure and properties (White)
 - 3 Ecosystems and fungi (Dighton)
 - 4 Non-fungi: Oomycetes, Chytrids, and slime molds (White; Kendrick chapter 1)
 - 5 Fungi and primary productivity: soil formation processes (Dighton; Hudler chap. 12)
 - 6 Lab-making media, culturing fungi, isolation from soil (Bergen/White)
 - 7 Fungi and primary productivity – mycorrhizae (Dighton; Hudler chap. 14)
 - 8 Lab-use of microscopes and identification of microscopic soil fungi (Bergen/White; Hudler chap.1; Kendrick chap. 1)
 - 9 Fungi and primary productivity – mycorrhizae Lab (Dighton)
- Exam 1 (100 pts)
- 10 Plant pathogenic fungi (Dighton)
 - 11 Fungi as food (Dighton)
 - 12 Ascomycete identification: structures and literature (White; Kendrick chap. 4)
 - 13 Fungi in the built environment (Dighton)

FUNGI AND HUMAN HEALTH

11:776:415 (3 credits)

Spring Semester (even years)

CONTACT INFORMATION

Instructor: Dr. Joan Bennett

Office Location: 296C Foran Hall, 59 Dudley Rd., New Brunswick, NJ 08901

Phone: 848-932-6223

E-mail: profmycogirl@yahoo.com

Office Hours: by arrangement

Co-Instructor: Dr. James White

Office Location: 294A Foran Hall, 59 Dudley Rd., New Brunswick, NJ 08901

Phone: 848-932-6286

E-mail: jwhite@aesop.rutgers.edu

Office Hours: by e-mail appointment

Co-Instructor: Dr. Ning Zhang

Office Location: 201B Foran Hall, 59 Dudley Rd., New Brunswick, NJ 08901

Phone: 848-932-6348

E-mail: zhang@sebs.rutgers.edu

Office Hours: by arrangement

COURSE DESCRIPTION

The best known fungi are macroscopic (e.g. mushrooms, truffles and their relatives) but the most abundant forms of fungal life are the microscopic molds and yeasts. Fungi impact human health directly as infectious agents, allergens and toxin producers. They also play important

roles in food safety and can comprise food supplies through plant pathogenesis. On the positive side, they are important in food production and as agents of fermentation. Some of the most potent drugs isolated during the 20th century (penicillin, the statins, immunosuppressants) are fungal metabolites. This course will address these broad topics through lectures, discussions, readings, and special projects.

This course is intended for advanced undergraduates and graduate students across Rutgers University who will benefit from learning about the impact of fungi on human health, nutrition and drug discovery. The course may be of particular interest to students involved in the study of food science and nutrition; animal and health sciences; microbiology; pharmacology; and plant pathology.

COURSE WEBSITE, RESOURCES AND MATERIALS

- Course website: Sakai
- Course materials will be posted to Sakai after class
- Supplementary reading: Several mycology textbooks, as well as other books on medical mycology, medical fungi, mushroom cultivation, and related topics, are available in 205 Foran Hall.

PREREQUISITE: 01:119:115-116 General Biology (two semesters) OR equivalent

COURSE LEARNING GOALS

(Link to Plant Biology Undergraduate Program Goals:
<http://plantbiology.rutgers.edu/undergrad/plantbiology/>)

By the end of this course, the student will be able to:

1. Demonstrate a basic understanding of the fungi that impact human health in a positive or negative way (addresses program goal 1)
2. Define the specialized vocabulary of medical mycology (addresses program goal 1)
3. Integrate an understanding of fungi into other realms of biology and the health sciences (addresses program goal 2)
4. Formulate information about fungi into new understanding of general topics in the health sciences and cognate disciplines (addresses program goals 2 and 4)
5. Apply information about fungi to everyday life (addresses program goal 3)

ASSIGNMENTS/RESPONSIBILITIES AND ASSESSMENT

Grading

- Two midterm exams (25% each) 50%
- Final exam (comprehensive) 30%
- Special project 10%
- Attendance and participation 10%

Grades will be classified based on Rutgers approved system: A, B+, B, C+, C, D, and F.

Special project: This small group, open ended project is subject to instructor approval. Examples of project ideas include: a report on a field trip to a mushroom farm; organization of a small cookbook on edible fungi and fermented foods, plus a class room cooking demonstration; development of a learning module on poison control centers; an analysis of mold remediation

companies; an outreach program on urban housing and asthma; a review of antifungal drug development as conducted at a local pharmaceutical company; a project on the medical implications to public health of the emergence of widespread development of bacterial resistance to penicillin and other betalactams; organization of a summary of web-based teaching tools about fungi and human health; an organized collection of mycological humor; mycology in art; etc.

Learning goals assessment: Specific questions on exams will be used to assess student knowledge of all course learning goals. In the special project, students will communicate an integration of technical knowledge with the broader issues associated with fungi in the health sciences, environment, and everyday life (course learning goals 3 to 5). The percentage score on these assessments will determine the level of mastery: >90% outstanding; 80-89% good; 70-79% satisfactory; <69% unsatisfactory.

PARTICIPATION GRADE AND ABSENCE POLICY

Students are expected to attend all classes – attendance will be recorded. More than two unexcused absences will have a negative impact on grade. Students who expect to miss class may contact the instructor via e-mail prior to the missed class or may use the University absence reporting website (<https://sims.rutgers.edu/ssra/>) to indicate the date and reason for the absence. An e-mail is automatically sent to the instructor.

COURSE SCHEDULE

Week Topic

- 1 Introduction: What are fungi? Basics of morphology and biochemistry
- 2 Theories about disease. What is a pathogen? Mycoses: history, concepts, classification
- 3 Mycoses: superficial and subcutaneous Mycoses: dimorphism General groups for mycophagy and special projects
- 4 Fungi in folklore and history
- 5 Mycoses: systemic and other Antifungal drugs
- Special project topics due
- 6 Exam I: Fungi as food: “mycophagy”
- 7 Fungi in food and drink – fermentations
- Fungi and food safety – spoilage and introduction to mycotoxins
- 8 Dinner with fungi on the menu (class members bring fungal foods to class)
- Fungal toxicology – mushroom poisons
- Spring recess
- 9 Fungal toxicity – mycotoxins
- Fungi, allergy and indoor air quality
- 10 Hallucinogenic fungi and hallucinogens
- Fungi as pharmaceuticals: traditional medicine, antibiotics
- 11 Fungi as pharmaceuticals: statins and immune suppressants
- Special topic – Cryptococcus and its treatment
- 12 Introduction to fungal systematics, phylogeny, and identification
- Special topic – Amanitaceae: taxonomy and toxins
- 13 Exam II

Presentation of student projects

14 Presentation of student projects

Final Exam (comprehensive, date to be determined)

FINAL EXAM/PAPER DATE AND TIME

The final exam is comprehensive. The Online Final exam Schedule:

<http://finalexams.rutgers.edu/>

ACCOMODATIONS FOR STUDENTS WITH DISABILITIES

Please follow the procedures outlined at <https://ods.rutgers.edu/students/registration-form>.

Full policies and procedures are at <https://ods.rutgers.edu>