

**Lock Haven University of Pennsylvania**  
**Lock Haven, Pennsylvania**

**Department of Biological Sciences**  
**Mycology**

**I. Introductory information:**

<b>A. Department:</b>	Biological Sciences
<b>B. Departmental catalogue number:</b>	BIOL317
<b>C. Course title:</b>	Mycology
<b>D. Credit in terms of semester hours:</b>	3
<b>E. Clock hours per week:</b>	5 (3 lab/2 lecture hours)
<b>F. Overlays:</b>	WE/IL
<b>G. Restrictions:</b>	Prerequisite: CHEM121 and BIOL202 (or permission of instructor).

**II. Description of course****A. Catalog 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.

**B. Comprehensive description:**

This course is an elective designed to provide further opportunities for students to evaluate the microbial world by studying fungal diversity. The course will be helpful for students attending medical school, graduate programs in zoology, microbiology, plant pathology, and botany, as well as, for secondary education majors (biology track). This course could also benefit students majoring in health related disciplines because it will provide their only exposure to mycology, especially human pathogenic fungi, before working in a clinical setting. The course will provide students with an understanding of the basic tenets of mycology which include concepts related to anatomy, morphology, taxonomy, genetics, evolution, physiology, ecology, and medical mycology.

**III. Exposition:**

## A. Objectives

Upon completion of this course, students will be able to do the following:

1. Make clear the importance of Mycology as a past, present, and future science.
2. Engage in the nature of science and be able to conduct and design scientific investigations, use tools and applications, analyze and communicate the results of their research and apply this knowledge to the unifying themes of science.
3. Describe and compare the chemical, structural and functional similarities and differences that characterize fungi and analyze their relationships to each other.
4. Explain the basics of fungal metabolism and correlate these cellular processes to multiple levels of organization.
5. Compare the mechanisms of cellular reproduction (mitosis and meiosis) and integrate these processes into a morphological based classification systems based on reproduction strategies, life cycles, and anatomical structures.
6. Elucidate basic concepts of natural selection and the mechanisms of fungal evolution and how they relate to fungal diversity.
7. Study fungal relationships in different ecological systems including the significance of symbiotic and pathogenic adaptations.

## B. Activities and requirements

Activities will include lectures and discussions of assigned reading material and inquiry investigations. Students are expected to attend 5 hours of class (3h laboratory/2h lecture) per week. Active participation in class discussions is expected. Classes will be augmented by using multimedia and other interactive teaching/learning tools. Grades will be based on quizzes, exams and other assignments given throughout the semester.

### Activities related to objectives in III. A

1. Students will learn a brief history of mycological achievements from the past and discuss the future direction of mycology as a discipline, especially with respect to the increase in human fungal diseases because of immune system suppression.
2. Students will conduct and design scientific investigations to identify unknown fungal isolates, using tools such as PCR and DNA sequencing, microscopy, and cultural techniques. Students will analyze and communicate the results of this research in the form of a research paper on the genus of one unknown, and in a 15 minute power point presentation following a research symposium format, including a written abstract to be disseminated during the symposium.
3. Students will participate in hands-on, inquiry-based activities and discussions as they learn about the chemical, structural and functional similarities and differences that characterize fungi. Students will use morphology (structural similarities and differences) to identify 20 different

genera of fungi collected during a field trip and required outside class collecting.

4. Students will participate in hands-on, inquiry-based activities and discussions as they learn about the basics of metabolism by fungi.
5. Students will participate in hands-on, inquiry-based activities and discussions as they learn about the basic developmental processes and life cycles of fungi.
6. Students will participate in hands-on, inquiry-based activities and discussions as they learn about how a set of genetic instructions determines ascospore color in fungi during laboratory exercises.
7. Students will participate in hands-on, inquiry-based activities and discussions as they learn about basic concepts of natural selection as a mechanism of fungal evolution.

**C. Major units and time allotted (contact hours allotted by subject)**

1. Kingdoms, Classification, Evolution, and Biodiversity
  - A. Pseudo fungi (Protozoan fungi, Chromista fungi) 2
  - B. Kingdom Eumycota (Zygomycota) 2
  - C. Kingdom Eumycota (Dikaryomycota, Basidiomycetes) 6
  - D. Kingdom Eumycota (Dikaryomycota, Ascomycetes) 6
  - E. Lichens and Yeasts—Polyphyletic fungi 2
2. Fungal Physiology 2
3. Fungal Genetics--Molecular and Mendelian Genetics 2
4. Fungal Ecology and Symbioses 3
5. Mycotoxins and Medical Mycology 5

**D. Materials**

1. **Suggested textbook**

Kendrick, B. (2004). *The Fifth Kingdom*. Mycologue Publications.

**Text includes interactive CD-ROM with animations, synoptic key to 2000 species, 1500 pictures and figures, and search engine by keyword for the entire text. CD-ROM is updated yearly with current research.**

2. **Other materials**

Laboratory exercises and procedures will be written by instructor and may be used in the form of a manual. Students will be required to maintain a laboratory notebook.

### 3. Bibliographic support

- Ainsworth, G.C., and A.F. Sussman (1965). *Fungi, an Advanced Treatise*. New York, Academic Press, 4 volumes.
- Ainsworth, G.C. (2004). *Ainsworth & Bisby's Dictionary of Fungi*, 5<sup>th</sup>, ed. Kew, Surrey, Commonwealth Mycological Institute.
- Barnett, H.L., and B.B. Hunter (1998). *Illustrated Genera of Imperfect Fungi*. St. Paul, Minnesota, APS Press., 218p.
- Benka, E.S., and A.C. Rogers (1971). *Medical Mycology Manual*, 3<sup>rd</sup> ed. Minneapolis, Burgess Pub. Co., 300p.
- Bissette, A.E., Bissette A.R., and D.W. Fisher. (1997). *Mushrooms of Northeastern North America*. Syracuse N.Y., Syracuse University Press, 218p.
- Cooner, D.G. (1964). *Thermophilic fungi, an Account of Their Biology, Activities, and Classification*. San Francisco CA, W. H. Freeman, 188p.
- Fergus, C. (1964). *Illustrated Genera of Wood Decay Fungi*. Minneapolis MN, Burgess, 132p.
- Frey, D. (1979). *Color Atlas of Pathogenic Fungi*. Chicago, Year Book Medical Publishers.
- Hart, C.A. (2004). *Microterrors: the complete guide to bacterial, viral, and fungal infections that threaten our health*. Buffalo, N.Y., Firefly Books.
- Moore-Landecker, E. (1982). *Fundamentals of the Fungi*, 2<sup>nd</sup> ed. Englewood Cliffs, N.J., Prentice-Hall.

## **IV. Standards**

Grades will be assigned in accordance with University policy. They will be based on examinations, quizzes, an oral presentation, laboratory projects/reports, written assignments, and practical examinations.

### **Assessment related to the objectives:**

1. Students will compare and contrast mycological research from the past to present, and discuss the future of this discipline.
2. Performance assessments will be used to determine if students can integrate biological concepts and the nature of science as they conduct and design scientific investigations, use tools and applications, analyze, and communicate the results of research.
3. Various forms of formative and summative assessments will be used to determine student understanding of the chemical, structural and functional similarities and differences that characterize fungi at both the cellular and whole organism level.
4. Achievement on examinations and performance on projects will be used to assess student understanding of basic developmental processes and life cycles in fungi.
5. Information from previous course work will be reviewed in an applied setting. The student's ability to describe how a set of genetic instructions determines inherited traits of fungi and how genetic information is inherited and expressed will be measured through formative responses provided during a genetics laboratory in which inheritance of genetic traits can be directly observed.
6. Students will complete examinations that will test their understanding of topics presented in readings and lecture concerning the basic concepts of natural selection and the mechanisms of biological evolution.
7. Various forms of formative and summative assessments will be used to determine student understanding of the relationships among and between symbiotic and pathogenic fungi.

## V. Rationale:

- A. The integrated approach of the course will reinforce biological principles learned in other courses and expose students to the significant role fungi play in the ecosystem, agriculture, and medicine. This course will be helpful for students wishing to attend graduate school in a variety of fields, and may be the only opportunity that health science majors will have to study the fungi, which are increasingly becoming a medical problem in humans with compromised immune systems.
- B. Departmental alumni surveys indicate interest in development of a Mycology course at Lock Haven University by a small number of individuals surveyed. Many schools in our region including Cornell University, Penn State, Howard University, SUNY-ESF, and Bloomsburg University offer Mycology as part of the biology undergraduate curriculum. In fact, mycologists from universities in our region meet once a year for the Peck Mycological Foray and Workshop to train students in fungal identification. The Peck Foray will be held at Lock Haven University, September 21<sup>st</sup>-23<sup>rd</sup>, 2007 at the Sieg Conference Center and marks the first time the foray will be held in Pennsylvania in the 54 successive years that it has been attended. In addition, there are many job opportunities for undergraduate students with rigorous training in botany and mycology with the Department of Homeland Security as Plant Inspection and Quarantine Officers (USAjobs.com). These positions require that courses in Mycology, Botany, and Microbiology are completed by applicants in order to qualify for government service. Finally, the repetition of biological themes while studying a specific organismal group, such as the fungi, would benefit all biology majors because it will reinforce biological principles learned in other courses. The course is highly integrated, providing students with a comprehensive insight into the relationships between structure and function in fungi, from a cellular and whole organism approach, as well as, an understanding of the role fungi play in human and natural environments. The basic unifying themes of biology such as evolution and energy transfer are stressed, enabling students to integrate information learned in other science courses.
- C. No other Departments will be affected.

## VI. Cost and staff analysis:

- A. This is a new course, but will be taught by current faculty and require resources typical of a laboratory biology course with one section.
- B. This course will be taught during fall semester on an alternating year basis, and will require 5 faculty contact hours for one section to be offered.

## VII. Date approved by University President:

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(Signature)

(Date)