

GENERAL MYCOLOGY 427R/527R - Course Information

Marley 217 Tues/Thurs 9:30-10:45 am

INSTRUCTOR: Dr. Marc Orbach

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Office hours: Wed 1:30-3:30 pm or by appointment.

COURSE DESCRIPTION:

This course is intended to introduce students to the diverse group of organisms in the Fungal kingdom and to the fungus-like organisms including the Oomycota and the slime molds. These microorganisms profoundly impact humans and the environment in both positive and negative ways. Fungi are both responsible for significant production of food and for devastating famines and contamination of food. Fungi have led to great advances in the treatment of infections through the discovery of antibiotics yet some fungi are the agents that cause many serious illnesses, especially among immuno-compromised patients. Fungi are important models for biotechnology. One of the most important roles that fungi play is that of recycler of organic material, which reduces complex molecules to simpler ones that can be re-used by other organisms. Fungal biotechnology is an important area for development of modern industrial products.

The course format will include lectures, discussions, quizzes, exams and a research paper.

Prerequisite: MCB 181R or MIC 205.

MAJOR PURPOSES: Upon completing this course students should be able to:

- 1) Differentiate the major features that separate the Eukaryotes and Prokaryotes
- 2) Define the unique features that distinguish Fungi from organisms in the other kingdoms (Plantae, Animalia, Eubacteria, Archaeobacteria)
- 3) Describe the critical role that fungi play in the environment with specific emphasis on the carbon cycle
- 4) Distinguish the features of true fungi from the fungus-like organisms in the Oomycota and the slime molds in the Protoctista
- 5) Explain the importance of the asexual vs. the sexual phases of fungal life cycles
- 6) Distinguish the life cycles of the phyla of the true Fungi, and those of the Oomycota, and true and cellular slime molds
- 7) Explain the critical role that fungi play in genetic and molecular research
- 8) Discuss the importance of fungi in industrial production
- 9) Describe the positive and negative interactions fungi have with plants, animals, and other fungi
- 10) Compare and contrast fungal genes and genomes to those of other eukaryotes and of bacteria

TOPICS:

This course is divided into four sections. The first section will introduce the features that distinguish fungi from other organisms and the general methods they use for growth, reproduction and dispersal. The second section will examine in detail the features of the different phyla of fungi and related organisms. The third section of the course will cover the uses of fungi for basic, molecular, and industrial research, and the fourth section will cover fungal interactions with other organisms.

	DATES	TOPIC	Readings
Module 1		Introduction to Mycology	
	Day 1 – 8/27	Course requirements, Introduction to Fungi, Why Are Fungi Important to us?	Alexopolous, Mims & Blackwell- Chapter 1
	Day 2 8/29	The Major Groups of Fungi	AM&B Chapter 3
Module 2		Fungal Cell Biology, growth reproduction and dispersal	
	Day 3 9/3	Fungal Cellular Structure and Growth Requirements	AM&B Chapter2
	Day 4 and 5 9/5 and 9/10	Fungal Asexual Life cycles: Growth and Spore Development	
	Day 6 9/12	Sexual Reproduction	Deacon Chapter 9 Heterokaryosis and Parasexuality section
	Day 7 9/17	Exam #1	
	Day 8 and 9 9/19 and 9/24	Spore Release, Dispersal, Dormancy and Germination	Deacon Chapter 10, Spores, dispersal and dormancy
Module 3		Fungal Phyla – learning life cycles	

	Day 10 9/26	True and Cellular Slime Molds, Myxomycota, Dictyosteliomycota	AMB Chapter29 Myxomycota AMB Chapter27, Dicytosteliomycota
	Day 11 10/1	Oomycota, Hyphochytriomycota	AMB Chapter 23 Oomycota
	Day 12 10/3	Chytridiomycota	
	Day 13 10/8	Zygomycota and Glomeromycota	Webster Chapter 7 Zygomycota Webster Chapter 7b Entomophthorales
	Day 14 10/10	Exam #2	
	Days 15, 16, 17 10/15, 10/17 and 10/22	Ascomycota	
	Days 18 and 19 10/24 and 10/29	Basidiomycota	
	Day 20 10/31	Catch up/Review	
Module 4		Fungi in Research and Industry	
	Day 21 11/5	Fungal Genetics- Beadle and Tatum, biochemical mutants	
	Day 22 11/7	Fungal Molecular Biology and Genomics	

	Day 23 11/12	Exam #3	
	Day 24 11/14	Industrial Applications –chemicals, antibiotics, Fungal Biotechnology	
Module 5		Fungal Interactions with other organisms	
	Day 25 11/19	Fungal Plant Pathology	
	Day 26 11/21	Mycotoxins Guest Lecture- TBA	
	Day 27 11/26	Human Pathogens-Medical Mycology	
	11/28	Thanksgiving Break	
	Day 28 12/3	Insect Associations, biocontrol	
	Day 29 12/5	Lichens and Endophytes	
	Day 30 12/10	General Review	
FINAL EXAM	12/17	FINAL EXAM from 8-10 am in Marley 217	

TEXT: There is no required text for the course. Chapters from books will be available on the course website for reference as well as articles, webpages and other useful materials.

Introductory Mycology (Fourth ed., 1996) by C.J. Alexopolous, C. W. Mims and M. Blackwell. This book was once, **THE** reference, but it is quite dated now due to the rapid changes in taxonomy due to molecular genetics. It is very useful for descriptions of individual fungi. It is not required.

Fungal Biology (Fourth ed., 2006) by J. W. Deacon. This text has limited descriptions of species, but has very good chapters on fungal growth, development, nutrition and interactions with other organisms.

Other useful texts:

- Webster and Weber, Introduction to Fungi, 3rd ed. (2007)
- Carlile et al. The Fungi 2nd ed. (2001)
- Kendrick, The Fifth Kingdom 4th ed. (2017)

Materials will be placed on the website for specific class sections.

WEB PAGE: <https://d2l.arizona.edu/d2l/home/827505>

The course web page will contain all the important information for class including all deadlines. Useful information will include this document, powerpoint presentations of lectures, panopto recordings, and additional related links. Information relevant to the lecture section is being continually added. The web page serves as a resource for terminology, photos of fungal structures and life cycles, fungal systematics and for links to many fungal resources on the internet. Study guides and practice exams are also available on the course page. Check it out as a useful source of information.

GRADES:

Your course grade will be based on quizzes, exams, and your paper assignments.

For 427R, grades will be determined based on a possible 550 point total. For 527R, grades will be based on a 650-point total.

Grades will be computed based on a percentage of points from the total:

- A = 90-100%
- B = 80 - 89%
- C = 70 - 79%
- D = 60 - 69%
- E = \leq 59%

GRADE DEFINITIONS

A: Achievement that is outstanding relative to the level necessary to meet course requirements.

B: Achievement that is above the level necessary to meet course requirements.

C: Achievement that meets the course requirements.

D: Achievement that is worthy of credit even though it fails to fully meet the course requirements.

E: Represents failure (no credit) and signifies that the work was not worthy of credit or was not completed.

Hourly exams: There will be three hourly exams worth 100 points each. These exams will emphasize the material covered between exams, but some cumulative knowledge will be required.

Final Exam: The Final exam will be worth 150 points and will be 50% covering material since the third hourly exam, and 50% cumulative. **The Final Exam will be on 12/17/18 from 8-10 am.**

Exams may include definitions, short answer, true/false, matching and multiple-response multiple-choice questions. Practice exams will be available on the course web page.

Term Paper: A five-page term paper will be worth 50 points of the grade. This paper gives students the opportunity to research in depth, a mycology topic of their interest. The paper should be well-researched with the topic chosen in consultation with, and approved by, Dr. Orbach. The paper should be double-spaced and written in proper scientific style with bibliographic references and in-

text citations. At least five references **must** be from peer-reviewed sources so their accuracy is supported. **For students taking 527R, the term paper should be 10 pages to allow a more in depth exploration of a topic in fungal biology.** The paper is due by Wednesday December 4, 2019 and will be submitted electronically. Term paper topics are to be chosen and approved by 10/23/19. Feel free to discuss the paper with Dr. Orbach as you are considering topics and while you are writing to get feedback and input.

Oral Presentations: Students taking 527R are required to give an oral presentation (~30 minutes) on a topic of their choice for 100 points. These will be added to the course and be required viewing for other students. These will be chosen with consultation from the instructor and will represent a topic of interest to the student, **separate** from their term paper topic.

Quizzes: There will be occasional quizzes either given at the beginning of class periods or as at home assignments. It is hoped these will encourage keeping current with the lecture material. Up to 5 quizzes will be given for a total of 50 points.

POLICIES:

Extra Credit Policy:

There is no Extra Credit Scheduled for this course, but some opportunities may arise.

Late Policy:

An assignment turned in late will be reduced by 5% of its total value for every day it is late including weekends.

Requests for incomplete (I) or withdrawal (W) must be made in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

ABSENCES AND CLASS PARTICIPATION POLICY:

The UA's policy concerning Class Attendance, Participation, and Administrative Drops is available at: <http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative-drop>

Participating in the course and attending lectures and other course events are vital to the learning process. You are expected to attend class and participate in class discussions. Participation will be noted and may be used to assist your final grade when you are on the border between grades. If you anticipate being absent, are unexpectedly absent, or are unable to participate in class online activities, please contact me as soon as possible. To request a disability-related accommodation to this attendance policy, please contact the Disability Resource Center at (520) 621-3268 or drc-info@email.arizona.edu. If you are experiencing unexpected barriers to your success in your courses, the Dean of Students Office is a central support resource for all students and may be helpful. The Dean of Students Office is located in the Robert L. Nugent Building, room 100, or call 520-621-7057.

You are strongly encouraged not to miss exams. If extenuating circumstances cause you to miss an exam due to an emergency, discuss with Dr. Orbach the potential for a make-up exam. Students will not be allowed to make-up exams for non-academic reasons (e.g. family vacation, early holiday travel). If a student is allowed to make up an exam, it will include a written exam and an oral exam session. Students will not be allowed to make up in-class discussions or writing assignments without letting the instructor know in advance (via e-mail) that they will be missing class on a given day.

The UA policy regarding absences for any sincerely held religious belief, observance or practice will be accommodated where reasonable, <http://policy.arizona.edu/human-resources/religious-accommodation-policy>

MAKEUP POLICY FOR STUDENTS WHO REGISTER LATE:

Students who register after the first class meeting may make up missed assignments/quizzes and should meet with Dr. Orbach at the earliest possible date to determine when materials will be due.

MISSED QUIZZES POLICY:

Students will be allowed to make-up a quiz only on rare occasions for justifiable, extenuating circumstances. Students will not be allowed to make-up quizzes for non-academic reasons (e.g. family vacation, early holiday travel). If a student is allowed to make up a quiz, it will most likely include an additional oral component.

COURSE WITHDRAWALS AND INCOMPLETE GRADE POLICIES

Students withdrawing from this course must notify the instructor **and** execute drop or withdrawal procedures, prior to non-attendance in class and must execute drop or withdrawal procedures in accordance with University policies, which are available at <http://catalog.arizona.edu/policy/grades-and-grading-system#incomplete> and <http://catalog.arizona.edu/policy/grades-and-grading-system#Withdrawal> respectively.

Any incomplete given must be verified with a written agreement with the student that specifies the work to be done and a timetable of completion.

ACCESSIBILITY AND ACCOMMODATIONS:

At the University of Arizona, we strive to make learning experiences as accessible as possible. If you anticipate or experience barriers based on disability or pregnancy, please contact the Disability Resource Center (520-621-3268, <https://drc.arizona.edu/>) to establish reasonable accommodations.

SHARING OF KNOWLEDGE AND CODE OF ACADEMIC INTEGRITY

Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of

independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See:

<https://deanofstudents.arizona.edu/student-rights-responsibilities/academic-integrity>.

The University Libraries have some excellent tips for avoiding plagiarism, available at <http://new.library.arizona.edu/research/citing/plagiarism>.

Selling class notes and/or other course materials to other students or to a third party for resale is not permitted without the instructor's express written consent. Violations to this and other course rules are subject to the Code of Academic Integrity and may result in course sanctions. Additionally, students who use D2L or UA e-mail to sell or buy these copyrighted materials are subject to Code of Conduct Violations for misuse of student e-mail addresses. This conduct may also constitute copyright infringement.

CLASSROOM BEHAVIOR

To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (e.g., texting, chatting, reading a newspaper, making phone calls, web surfing, etc.). It is expected that students may disagree with the research presented or the opinions of their fellow classmates. To disagree is fine but to disparage others views is unacceptable. All comments should be kept civil and thoughtful.

Some learning styles are best served by using personal electronics, such as laptops and iPads especially for note taking. However, if these devices become distracting you may be asked to stop using them or move to an area where they cause less distraction to other learners.

THREATENING BEHAVIOR POLICY

The UA Threatening Behavior by Students Policy prohibits threats of physical harm to any member of the University community, including to oneself. See

<http://policy.arizona.edu/education-and-student-affairs/threatening-behavior-students>.

UA NONDISCRIMINATION AND ANTI-HARRASSMENT POLICY: The University is committed to creating and maintaining an environment free of discrimination; see

<http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment-policy>

Our classroom is a place where everyone is encouraged to express well-formed opinions and their reasons for those opinions. We also want to create a tolerant and open environment where such opinions can be expressed without resorting to bullying or discrimination of others.

STATEMENT OF COPYRIGHTED MATERIALS:

Students are advised that all lecture notes, lectures, study guides and other course materials disseminated by Dr. Orbach to the students, whether in class or online, are original materials and as such reflect intellectual property of the instructor or author of those works. All readings, study

guides, lecture notes and handouts are intended for individual use by the student. Students may not distribute or reproduce these materials for commercial purposes without the express written consent of the instructor. Students who sell or distribute these materials for any use other than their own are in violation of the University's Intellectual Property Policy (available at <https://policy.arizona.edu/research/intellectual-property-policy>). Violations of the instructor's copyright may result in course sanctions and violate the Code of Academic Integrity.

CONFIDENTIALITY OF STUDENT RECORDS:

Students should read and be aware of federal regulations regarding the privacy of their academic records. <http://www.registrar.arizona.edu/personal-information/family-educational-rights-and-privacy-act-1974-ferpa?topic=ferpa>

SUBJECT TO CHANGE STATEMENT: Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor. We will try to cover as much fungal biology as possible but may identify interesting topics, not available prior to the semester that we want to explore.