Biology 342 Fungi, Environment and People

Term: 2 **Room:** Biology 124
Start Date: Jan 3, 2018 **Time:** 10.30 am-11.20 am M W F

Instructor Information

Lecture Instructor: Dr. Pratibha Prashar
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Office Hours: By Appointment

Lab
Laboratory Demonstrator: Jacey Bell
Email: jacey.bell@usask.ca
Room: Biology 307
Time: 1:30 pm - 5:20 pm Thursday

Course Description

Prerequisite(s): BIOL 120 and 121

Course Introduction

Fungi have major impacts on the environment, human health, agriculture, and biotechnology. In this course we examine fungal diversity, cell biology and development, physiology, ecological roles of fungi, and applied aspects of mycology including the biotechnology applications in this diverse and successful group.
Biology 342 Fungi, Environment and People will extend the basic survey of fungi provided in Biology 121 and consider their relationships with their environment, including other organisms. Fungi affect many aspects of our daily lives. Mycorrhizal fungi were essential for land colonization by plants (~450 million years ago), which was necessary for colonization by animals. Yeasts and filamentous fungi have been used by humans since antiquity, although the details were not understood until much later. The air we breathe contains spores that are potential pathogens or allergens. Fungi are part of the normal microbiological community living on our skins. Some fungi are symbionts with plants or animals, some fungi provide essential

recycling services, and other fungi are parasites or pathogens. In all, people compete with fungi for food resources, contend with them as pathogens and agents of decay, and exploit them in applied mycology. Fungal cells are small, and many do not form macroscopic communities. So, unless occurring as aggregates (for example mushrooms) or in pure culture, they can be difficult to detect without microscopy. Biology 342 will consider these and other aspects of fungi, their relationships with the environment, and their relationship with people.

Learning Outcomes

This course will consider fungal morphology, classification, physiology, ecology, the economic roles of fungi, fungi in medicine, and applied mycology. Successful completion of Biology 342 will also provide you with practice in techniques for isolating, identifying, and examining filamentous fungi. We will compare how fungi contribute to ecological stability, and how they explore and exploit the environment for their own needs. By the end of the course, you should be able to:

- Describe the cellular and genetic characteristics of fungi and fungus-like organisms.
- Describe cellular and taxonomic relationships between fungi and members of the fungal union.
- Classify major fungal groups, and describe their distinguishing features.
- Compare modes of fungal nutrition and reproduction.
- Describe ecological relationships of fungi with plants and animals.
- Describe the economic impact of fungi through crop diseases, food productions, and food spoilage etc.
- Describe and explain how fungi are used in traditional and modern biotechnology.
- Describe and explain role of fungi in biocontrol and bioremediation

Course Schedule

Week	Date	Module	Topics
1	Jan 3-5, 2018	Course organization, General Characteristics of Fungi	Introduction, Morphology, Feeding Types
2	Jan 8-12	Biodiversity	Slime molds, Chromista, Eumycota, Zygomycetes,
3	Jan 15-19	Biodiversity	Ascomycetes, Basidiomycetes, Anamorphic Fungi
4	Jan 22-26	Growth and Reproduction	Growth patterns, Sporulation, and Dormancy
5	Jan 29-Feb 2	Physiology	Fungal nutrition and metabolism
6	Feb 5-9	Ecology	Symbiotic relationships
7	Feb 12-16	Ecology, Midterm: Feb 16	Decomposers, Nutrient cycling,

Week	Date	Module	Topics
8	Feb 19-23	Midterm Break	
9	Feb 26-Mar 2	Economics	Plant parasitism and pathogens
10	Mar 5-9	Economics	Fungi as Food, Food Spoilage, Food Processing
11	Mar 12-16	Biotechnology	Ethanol fermentation, Antibiotics
12	Mar 19-23	Biotechnology	Enzymes, Specialty chemicals, Solid state fermentation
13	Mar 26-30	Applied Mycology	Biocontrol, Bioremediation
14	Apr 2-6	Review	

Instructor Profile

I've a background in microbiology, and I work as a postdoctoral fellow in department of Plant Sciences, U of S. My research interests lie around exploiting the plant-microbe interactions looking into three-way interactions between plant, pathogen and the biocontrol agent (microbes). I explore soil microbes for their potential to control plant pathogens, and to improve crop yields, eventually leading to sustainable green/clean agricultural practices.
I've been dealing with fungus, to different extents, since I started my undergraduate in 'Industrial Microbiology'. For the last seven years now, including my PhD and postdoctoral research, I'm majorly focusing on biocontrol of fungal/fungal-like pathogens using bacterial and fungal agents. In the past, I've taught courses in microbiology, mycology and bioprocessing. Like other microorganisms, fungi are amazingly versatile organisms, and it is fascinating for me to look at the variety of interactions they have with humans, plants, animals and environment ranging from the most devastating plant diseases to much needed antibiotics, and all that comes in between.

Required Resources

Reading/Reference Texts
The Fifth Kingdom, *Bryce Kendrick*
The Biology of Plants, *Peter Raven*

Class Notes
Lecture PowerPoints will be posted on the Blackboard for the class
Student self-study project presentations will be uploaded on Blackboard for the class

Course Evaluation

Grading Scheme	Date	% of Final Grade
Midterm Exam	Feb 16, 2018	10
Final Exam	TBD	30
Project Paper	March 14, 2018	10
Presentation	March 22 and 29, 2018	10
Laboratory		40
Total		100%

Evaluation Components

1) Midterm Exam
Value: 10% of final grade
Date: February 16, 2018 during the class time
Length: 45 minutes
Type: In class exam covering all material up to the previous lecture
Description: Exam format may include fill in the blank, short answer, multiple choice questions and diagrams.
Please note: Students have 3 business days following a missed midterm to contact Pratibha Prashar regarding an alternative arrangement.

2) Final Exam
Value: 30% of final grade
Date: Final examinations may be scheduled at any time during the examination period (April 7 to April 28, 2018); students should therefore avoid making prior travel, employment, or other commitments for this period. If a student is unable to write an exam through no fault of his or her own for medical or other valid documentation must be provided and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures: http://students.usask.ca/academics/exams.php
Length: 3 hours
Type: Comprehensive
Description: Exam format may include fill in the blank, short answer, multiple choice, diagrams, and long answer.

Project and Presentation
Type: Project Paper and Presentation on a topic of your choice
Description: Identify a topic related to some aspect of fungi, their environmental interactions with animals or people, or biotechnology. A list of sample topics and useful resources will be provided.

You will need to choose a topic and presentation date within the first two weeks of term, and submit a Project Outline for review by **January 25, 2018**. Conduct library and internet research to inform yourself about the key issues related to your topic, including how people and the environment are affected. Create a well-rounded and informed viewpoint of key issues including how people and/or the environment are affected. If possible, propose a strategy for exploiting or mitigating the impact.

3) Paper (Report)

Value 10% of final grade

Paper Due Date: March 14, 2018

Project Outline (a.k.a. Storyboarding) must be submitted for approval by **January 25, 2018** including a PowerPoint presentation outlining your topic and key issues. This outline will form as the storyboard for your paper and the backbone of your presentation.

Paper should be written in Word, size 10 font, Times New Roman, 1.0 spacing, APA style bibliography, 5 pages not including figures and bibliography.

4) Presentations on either March 22 or March 29, 2018

Value: 10% of final grade

Date: Presentations will be on Thursday afternoons during the lab session either March 22 or 29, 2018

Present your ideas as a 15 min PowerPoint seminar. A copy of your PowerPoint will be archived on Blackboard for class files; these presentations will not be recorded. Presentations will be peer-reviewed. There will be two short written answer questions on the final exam related to the self-study presentations from other students in the class. Students cannot write about their own topic.

Laboratory

Value: 40% of final grade

Type: Weekly laboratory notebook entries, quizzes, participation, and final lab exam.

Description: Students are expected to attend each of the scheduled laboratory periods. 5% of your final grade will be awarded based on laboratory participation, including attendance and completion of all laboratory exercises. Lab notebook entries will be graded for completeness, representation, level of engagement, and aesthetics. Although laboratory exercises may be performed in pairs or groups, lab notebook entries must be submitted individually. There will be occasional quizzes to reinforce concepts learned in previous labs; these will be written at the beginning of the lab period. A cumulative final lab exam will be written during the last lab period of the term.

Late Assignments

Late assignments are excepted if permission is granted by the Instructor PRIOR to the due date.

There is a 10% per day penalty for late assignments.

Late assignments will not be accepted after the last day of class (April 6, 2018)

University of Saskatchewan Grading System (for undergraduate courses)

Exceptional (90-100) A superior performance with consistent evidence of:

- a comprehensive, incisive grasp of the subject matter;
- an ability to make insightful critical evaluation of the material given;
- an exceptional capacity for original, creative and/or logical thinking;
- an excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently.

Excellent (80-90) An excellent performance with strong evidence of:

- a comprehensive grasp of the subject matter;
- an ability to make sound critical evaluation of the material given;
- a very good capacity for original, creative and/or logical thinking;
- an excellent ability to organize, to analyze, to synthesize, to integrate ideas, and to express thoughts fluently.

Good (70-79) A good performance with evidence of:

- a substantial knowledge of the subject matter;
- a good understanding of the relevant issues and a good familiarity with the relevant literature and techniques;
- some capacity for original, creative and/or logical thinking;
- a good ability to organize, to analyze and to examine the subject material in a critical and constructive manner.

Satisfactory (60-69) A generally satisfactory and intellectually adequate performance with evidence of:

- an acceptable basic grasp of the subject material;
- a fair understanding of the relevant issues;
- a general familiarity with the relevant literature and techniques;
- an ability to develop solutions to moderately difficult problems related to the subject material;
- a moderate ability to examine the material in a critical and analytical manner.

Minimal Pass (50-59) A barely acceptable performance with evidence of:

- a familiarity with the subject material;
- some evidence that analytical skills have been developed;
- some understanding of relevant issues;
- some familiarity with the relevant literature and techniques;

- attempts to solve moderately difficult problems related to the subject material and to examine the material in a critical and analytical manner which are only partially successful.

Failure <50 An unacceptable performance

Criteria That Must Be Met to Pass
Must complete the midterm and final examination in order to pass the class.

Attendance Expectations
Students are expected to attend both lectures and labs.

Participation
5% participation mark for labs.

Recording of the Course
Recording the course is not allowed.

Student Feedback
Feedback from students is welcome and encouraged.

Integrity Defined (from the Office of the University Secretary)

The University of Saskatchewan is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Student Conduct & Appeals section of the University Secretary Website and avoid any behavior that could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

All students should read and be familiar with the Regulations on Academic Student Misconduct (http://www.usask.ca/secretariat/student-conduct-appeals/StudentAcademicMisconduct.pdf) as well as the Standard of Student Conduct in Non-Academic Matters and Procedures for Resolution of Complaints and Appeals (http://www.usask.ca/secretariat/student-conduct-appeals/StudentNon-AcademicMisconduct.pdf)

For more information on what academic integrity means for students see the Student Conduct & Appeals section of the University Secretary Website at: http://www.usask.ca/secretariat/student-conduct-appeals/forms/IntegrityDefined.pdf

Examinations with Access and Equity Services (AES)

Access and Equity Services (AES), formerly Disability Services for Students (DSS), is guided by Saskatchewan's Human Rights legislation and the duty to accommodate individuals requiring accommodations based on disability, religion, family status and gender identity. Students who have any need of any accommodations are strongly encouraged to register with AES if they have not already done so. Students who suspect they may have disabilities should contact AES for advice and referrals. In order to access AES programs and supports, students must follow AES policy and procedures. For more information, check https://students.usask.ca/health/centres/access-equity-services.php#AssistiveTechnologyRoom, or contact AES at 966-7273 or aes@usask.ca.

Students registered with AES may request alternative arrangements for mid-term and final examinations. Students must arrange such accommodations through AES by the stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.

Student Supports

Student Learning Services
Student Learning Services (SLS) offers assistance to U of S undergrad and graduate students. For information on specific services, please see the SLS web site https://www.usask.ca/ulc/.

Student and Enrolment Services Division
The Student and Enrolment Services Division (SESD) focuses on providing developmental and support services and programs to students and the university community. For more information, see the SESD web site http://www.usask.ca/sesd/

Treaty Acknowledgement

As we gather here today, we acknowledge we are on Treaty Six Territory and the Homeland of the Métis. We pay our respect to the First Nation and Métis ancestors of this place and reaffirm our relationship with one another.

Other Acknowledgements

I would like to acknowledge Dr. Susan Kaminskyj, Jacey Bell, and Nicole Kearns for their support in the creation of this course.