UNIVERSITY OF SASKATCHEWAN

COURSE SYLLABUS

COURSE TITLE:	**An Introduction to Ecology and Ecosystems**		
COURSE CODE:	82262	**TERM:**	Fall 2019
COURSE CREDITS:	3	**DELIVERY:**	Lecture & Practicum (Lab)
CLASS SECTION:	01	**START DATE:**	September 4, 2019
CLASS LOCATION:	Rm 106 Thompson (Biology) Building	**LAB LOCATION:**	Rm 212 Thompson Building
CLASS TIME:	MWF 9:30 – 10:20 am	**LAB TIME:**	L1 Mon. 1:30-5:20 pm L2 Tues. 1:30-5:20 pm L3 Wed. 1:30-5:20 pm
WEBSITE:	Via blackboard & main frame website		

Instructors

Philip D. McLoughlin

Course Coordinator
Room 310.5 Collaborative Sciences Research Building
306-966-4451
philip.mcloughlin@usask.ca

Version 1, Aug 2019 PDM/JH/SH

Jeff Hudson
Room 120.5 Collaborative Sciences Research Building
306-966-4412
jeff.hudson@usask.ca

Scott Halpin
Lab Coordinator
Room 118 Thompson Building
scott.halpin@usask.ca

Office Hours: Appointments can be set up with instructors by email. However, most inquiries will be best answered with an email response. Responses to specific questions about course material are at the discretion of each instructor. Further information about individual policies may be provided in the lecture or laboratory by each instructor.

Course Description

This course is designed for undergraduate students that have an interest in broadening their studies in biology; however, we encourage students from a variety of departments to take this course because the principles of ecology cross several disciplines within the Colleges of Arts and Science, Agriculture, and Veterinary Medicine.

Major topics include: an introduction to ecological principles and the functioning of aquatic and terrestrial ecosystems; individual-based ecology including behavior; population dynamics; community structure and dynamics; ecosystem production; energy flow and material recycling; and conservation biology. Your instructors have expertise in aquatic ecosystem ecology (Hudson), animal ecology (McLoughlin) and field data collection methods for terrestrial and aquatic systems (Halpin).

Prerequisites: BIOL 121 or GEOG 120 or 6 credit units in GEOL. Students with credit for BIOL 253 or PLSC 213 will not receive credit for BIOL 228.

Learning Outcomes

By the completion of this course, students will be expected to:

- Develop an introductory understanding of ecology. This understanding will be in four major ecological sub-disciplines: population, community, ecosystem, and global ecology;
- Be able to describe how the scientific method is applied in examples of ecological studies;
- Practice and apply numerical skills by compiling, summarizing and interpreting basic scientific data;
- Build critical thinking skills through the process of evaluating scientific information in Biol 228 laboratories and from the literature.
- Become familiar with the impacts of humans on ecological systems.
- Be able to describe mechanisms that support biological diversity at the individual, community, landscape, and global scales;
- Develop a sense of place by acquiring new knowledge about the ecology of populations, communities and ecosystems of Saskatchewan and Canada.

Information on literal descriptors for grading at the University of Saskatchewan can be found at the end of this document, and at:
https://students.usask.ca/academics/grading/grading-system.php

Please note: There are different literal descriptors for undergraduate and graduate students. More information on the Academic Courses Policy on course delivery, examinations and assessment of student learning can be found at:
http://www.usask.ca/university_secretary/council/academiccourses.php

The University of Saskatchewan Learning Charter is intended to define aspirations about the learning experience that the University aims to provide, and the roles to be played in realizing these aspirations by students, instructors and the institution. A copy of the Learning Charter can be found at:
http://www.usask.ca/university_secretary/LearningCharter.pdf

Schedule

The course consists of 50 minutes of lecture, three times a week. The first half of the course focuses on individual-level, population ecology, and community ecology; the second half of the course emphasizes ecosystem and global ecology. Laboratory exercises compliment the lecture material. The first two laboratories will be fieldtrips to introduce students to selected Saskatchewan ecosystems. Collection of ecological data, statistical analysis of ecological data, population growth models, diversity measures, communities, energy flow, and biomass distributions will all be examined.

Lecture Schedule (2019)

Week Of	Topic	Readings*
Sept. 4	Course Introduction; Overview and Scope of Ecology as a Science;	Ch. 1 (all)
Sept. 9	Individual-level Ecology; Distribution and Properties of Populations.	Ch. 8 (pp. 158-174) Ch. 9 (pp. 182-188)
Sept. 16	Properties of Populations, cont.; Population Growth.	Ch. 9 (pp. 188-191) Ch. 10 (all)
Sept. 23	Population Growth and Intraspecific Competition, Density-Dependence; Introduction to Interspecific Interactions.	Ch. 11 (pp. 221-229; pp. 235-236) Ch. 13 (pp. 260-276)
Sept 30	Interspecific Interactions, cont.: Competition and Predation.	Ch. 14 (pp. 280, 284-285, 286-288, 292-295, 298-304)
Oct. 7	Interspecific Interactions, cont.: Parasitism and Mutualism	Ch. 15 (pp. 308-315; 316); Ch 16 (pp.339-348)
Oct. 14	**Thanksgiving Day Holiday**	
Oct 16	**Biol 228 Mid-Term Exam (held in classroom)**	
Oct. 18	Carbon Cycle: Laws of Thermodynamics, Energy Flow, Food Webs (starting on Oct. 18)	Ch. 20

Oct. 21	Carbon Cycle: Laws of Thermodynamics, Energy Flow, Food Webs -Nitrogen, Phosphorus, Sulfur Cycles (and other cycles of interest)	Ch. 22
Oct. 28	Nitrogen, Phosphorus, Sulfur Cycles (and other cycles of interest)	
Nov. 4	Aquatic Systems: Freshwater and Marine Ecosystems	Ch. 24
Nov. 11	**Fall Mid-Term Break**	
Nov. 18	Aquatic Systems: Freshwater and Marine Ecosystems	
Nov. 25	Terrestrial Ecosystems: Grasslands and Boreal Forest	Ch. 23, sections 23.1, 23.4 and 23.9
Dec. 2	Terrestrial Ecosystems: Grasslands and Boreal Forest	
TBA	**Final Exam**	

*Readings will be supplemented on occasion with short articles

Laboratory Schedule (2019)

Week of	**LAB**
Sept 9	Beaver Creek Field Trip; An Introduction to Saskatchewan Ecosystems
Sept 16	Saskatoon Riverbank Field Trip; An Introduction to Saskatchewan Ecosystems
Sept 23	An Investigation of Population Growth I: Exponential Growth Models*
Sept 30	An Investigation of Population Growth II: Logistic Growth Models* **Quiz 1 (on Beaver Creek and Riverbank labs)**
Oct 7	Quantitative Vegetation Sampling Methods*
Oct 14	**NO LABS**
Oct 21	Statistical Analysis of Data; The χ^2 Test* **Quiz 2 (Population Growth labs)**
Oct 28	Energy Flow and Materials Distribution in Terrestrial Ecosystems*
Nov 4	Energy Flow and Materials Distribution in Aquatic Ecosystems*
Nov 11	***NO LABS**

Nov 18	Review **Quiz 3 (on Sampling Methods, Statistical Analysis and Energy Flow labs)**
Nov 25	Review
Sat Nov 30	**FINAL EXAM Saturday NOVEMBER 30th, 9:30 AM**

*** denotes labs with in-lab assignments**

SPECIAL NOTE: LABS BEGIN THE WEEK OF SEPTEMBER 9th

LABORATORY LOCATION: Room 212 Biology, Monday, Tuesday, Wednesday, 1:30-5:20 pm

Lab expectations and evaluation/assignment requirements will be discussed in the second lab period.

Laboratory mark breakdown: 25% from quizzes/assignments (see Assignments Section below), and 15% from lab exam

Midterm and Final Examination Scheduling

Midterm and final examinations must be written on the date scheduled.

Final examinations may be scheduled at any time during the examination period which extends from December 7 to 23; 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 reasons, documentation must be provided **WITHIN THREE WORKING DAYS** and an opportunity to write the missed exam may be given. Students are encouraged to review all examination policies and procedures: http://www.usask.ca/calendar/exams&grades/examregs/

Please note, final exams are rescheduled ONLY with a fee and by application to your College, following University-approved procedures.

Course Resources

Textbook

Smith M. S., R. L. Smith, and I. Waters. 2014. Elements of Ecology. 1st Canadian Edition. Pearson. Upper Saddle River, New Jersey.

The Textbook and Laboratory Manual for BIOL 228 is available at the U of S Bookstore: www.usask.ca/consumer_services/bookstore/textbooks

Electronic Resources

The laboratory portion of this course will require a working knowledge of computers and various computer programs, including MS Excel and Word. Computers will be used extensively to collect and analyze data and prepare reports in the laboratory. You will need to access your University computer account during the laboratory; make sure you know your university NSID and password and how to log on to your account. Further details are in the lab manual.

Downloads

These will be available as appropriate online (e.g., Blackboard or Main Frame websites). Please download and familiarize yourself with the course syllabus. Please note that instructor's PowerPoint slides may be provided to you as a courtesy. You are not required to download or print these slides. While we will endeavor to have the lecture PowerPoint slides posted sometime in advance of the lectures, we will not guarantee this. Each instructor will provide you with additional information about accessing information from websites.

Supplementary Resources

From time to time, your instructors may make supplementary material available to you. This material will not replace the lecture or lab experience and you are encouraged to attend all lectures and take your own notes. A number of paper-based resources for the laboratory may be placed on reserve for you in the Natural Sciences Library; information about these is provided in the lab manual as appropriate.

Grading Scheme

Mid-term	20%
Final exam	40%
Laboratory	40%
Total	**100%**

Evaluation Components (Lecture)

Midterm Exam

Value: 20% of final grade
Date: October 16th
Length: 50 Minutes
Type: Multiple choice
Description: **Calculators are required**, but note that cell phones and smart phones or other digital devices other than a basic calculator are not allowed.

Final Exam

Value: 40% of final grade
Date: Consult Final Exam Schedule
Length: 3 hours
Type: Multiple-choice
Description: Calculators or other electronic devices NOT permitted or required for the final exam.

Evaluation Components (Laboratory)

Assignment 1: Presentation of Data; Exponential Growth

Value: 1% of final grade (Approximately)
Due Date: IN LAB ASSIGNMENT (week of Sept 23)
Format: This assignment will require each student to prepare a figure based on data developed during the lab period which are to be organized and presented in a scientific manner.

Description: The figure will be drawn using MS Excel. A scientific figure caption will be written and included with each graph. Presentation quality graphing is required, i.e., clearly labelled axes, legends for graphs with more than one data set presented, lines and markers which are clearly different even in black and white printing, no shading of background, appropriate use of space etc. **See the example figure in Appendix 1 in the lab manual.** The figure must be printed and handed in to your lab demonstrator before the end of the lab period.

Learning Outcome: Proper preparation and presentation of scientific data.

Assignment 2: Sample Problem; Exponential Growth

Value: 1% of final grade (Approximately
Due Date: IN LAB ASSIGNMENT (week of Sept 23)
Format: This assignment will require each student to solve a mathematical problem relating to exponential growth theory and interpret the results. Similar questions will be found on quizzes and exams and similar supplemental practice problems will be provided.

Description: The problem will allow the student to apply equations developed from the exponential growth model to solve for specific variables and to interpret the results in light of exponential growth theory

Learning Outcome: Mathematical problem solving, understanding of the different variables used in exponential growth as defined in theory, relationship of individual variables to one another.

Assignment 3: Sample Problem; Logistic Growth

Value: 1.8% of final grade (Approximately)
Due Date: IN LAB ASSIGNMENT (week of Sept 30)
Format: This assignment will require each student to solve a mathematical problem relating to logistic growth theory and interpret the results. Similar questions will be found on quizzes and exams and similar supplemental practice problems will be provided.

Description: The problem will allow the student to apply equations developed from the logistic growth model to solve for specific variables and to interpret the results in light of logistic growth theory. The problem may require the student to draw on knowledge of exponential growth to compare and contrast outcomes and relationships between variables

Learning Outcome: Mathematical problem solving, understanding of the different variables used in logistic growth as defined in theory, relationship of individual variables to one another.

Assignment 4: Sampling Methods and the Effects of species dispersion on Frequency and Density measures in plant species

Value: 4.5% of final grade (Approximately)
Due Date: IN LAB ASSIGNMENT (week of Oct 7)
Format: This assignment will require each student to prepare a figure based on data developed during the lab period which are to be organized and presented in a scientific manner

Description: A scientific figure caption will be written and included with each graph. Presentation quality graphing is required, i.e. clearly labelled axes, legends for graphs with more than one data set presented, lines and markers which are clearly different even in black and white printing, no shading of background, appropriate use of space etc. **See the example figure in Appendix 1 in the lab manual.** This assignment will require each student to analyze data on frequency and density developed during the lab period in order to determine the dispersion of plant species in space and the resulting effect on accuracy of estimate of abundance. Trends in these data will be interpreted based on assumptions relative to the applied sampling method in the written portion of this assignment

Learning Outcome: An understanding of the purpose of sampling, assumptions made in sampling, basic sampling techniques used for various vegetation types, types of data that can be collected, the importance of dispersion patterns in the individuals of a species in sampling outcomes, the effect of scale on perceived patterns of dispersion.

Assignment 5: Statistical interpretation of ecological data

Value: 3.6% of final grade (Approximately)
Due Date: IN LAB ASSIGNMENT (week of Oct 21)
Format: This assignment will require each student to complete a χ^2 analysis based on data provided during the lab period which are to be organized and presented in a table in a scientific manner

Description: A scientific figure caption will be written and included with each table. Presentation quality table preparation is required, **See the example table in Appendix 1 in the lab manual.** This assignment will require each student to analyze data for the occurrence of each of several species in relation to an environmental gradient using the χ^2 statistical test Trends in these data will be interpreted based on the result of χ^2 calculations

Learning Outcome: An understanding of; the importance of statistics in analysis of ecological data, the basic assumptions related to the χ^2 test, the mathematics of the χ^2 test, null hypothesis development and falsification, interpretation of ecological data

based on χ^2 results, use of contingency tables in analysis of ecological relationships.

Assignment 6: Preparation of a Schematic Energy Flow Diagram for a Fescue Grassland

Value: 1.8% of final grade (Approximately)
Due Date: IN LAB ASSIGNMENT (week of Oct 28)
Format: This assignment will require each student to complete an energy flow diagram for a fesque grassland near Saskatoon

Description: Based on known relationships between energy and biomass, within and between trophic levels, each student will develop a detailed energy flow and biomass distribution diagram based on provided data.

Learning Outcome: An understanding of; energy, biomass, gross primary production(GPP), net primary production (NPP), Respiration (R), energy allocation.

Assignment 7: Preparation of an Energy Flow Diagram for tropical lake

Value: 1.8% of final grade (Approximately)
Due Date: IN LAB ASSIGNMENT (week of Nov 4)

Format: This assignment will require each student to complete an energy flow diagram for a tropical lake

Description: Based on data for the tropical lake provided each student will work out various efficiencies of energy transfer, within and between trophic levels, each student will develop a detailed energy flow and biomass distribution diagram based on provided data.

Learning Outcome: An understanding of; energy, biomass, gross primary production(GPP), net primary production (NPP), Respiration (R), energy allocation, calculation of energy transfer efficiencies.

Additional lab grading: QUIZZES (3 as per lab outline)

Value: 2.7% of final grade (Approximately)
Due Date: IN LAB at the start of the lab 1:30pm, as scheduled on the lab outline

Additional lab grading: DATA DEVELOPMENT

Value: 1.8% of final grade (Approximately)
Due Date: IN LAB, various labs where data is to be developed and submitted.

FINAL LAB EXAM

Value: 15% of final grade
Date: NOVEMBER 30th, SATURDAY, 9:30 AM.
Length: 2.5 hours
Type: Comprehensive, all labs covered. Closed Book.
Description: Multiple choice, true-false, matching and problem style questions will be employed. No Electronic devices except calculators allowed (cell phones or smart phones are not acceptable as calculators, nor are other electronic devices).

NOTE: The lab instructor reserves the right to adjust the values of the individual labs for reasonable circumstances. For example, but not limited to, weather interference in field data collection---marks for data development would be unavailable so these marks would be spread across remaining assignments thereby marginally raising the value for each assignment.

Criteria That Must Be Met to Pass

An overall course grade of 50% must be obtained to pass this course. Attendance at laboratories is mandatory. Excused absence from the laboratory is explained in the laboratory manual

Attendance Expectations

Students are encouraged to attend all lectures, and laboratories are mandatory. Additional information on laboratory attendance is provided in the Laboratory Manual

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

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/university_secretary/honesty/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/university_secretary/honesty/StudentNon-AcademicMisconduct2012.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/university_secretary/pdf/dishonesty_info_sheet.pdf

Examinations with Access and Equity Services for Students (AES)

To accommodate individuals requiring accommodations based on disability, religion, family status, and gender identity, students are strongly encouraged to register with AES if they have not already done so. Students who suspect they may have this need 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, please refer to https://students.usask.ca/health/centres/access-equity-services.php

Students registered with AES may request alternative arrangements for mid-term and final examinations.

Students must arrange such accommodations through AES by their stated deadlines. Instructors shall provide the examinations for students who are being accommodated by the deadlines established by AES.