COURSE OUTLINE

BIOL 220
ECOLOGY

3 CREDITS

PREPARED BY: Scott Gilbert, Instructor
DATE: August 20, 2020

APPROVED BY: Joel Cubley, Chair, School of Science
DATE: August 27, 2020

APPROVED BY SENATE: Click or tap to enter a date
RENEWED BY SENATE: Click or tap to enter a date

APPLIED SCIENCE & MANAGEMENT DIVISION
BIOL 220
Ecology
3 credits
Fall, 2020

ECOLOGY

INSTRUCTOR: Scott Gilbert, B.Sc., PhD **OFFICE HOURS:** Tu / Th 9:30-10:30 via

Zoom software or by email appointment.

OFFICE LOCATION: A2515

CLASSROOM: Lecture: via Zoom
Lab: T1090 (Earth Sciences lab)

E-MAIL: sgilbert@yukonu.ca

TIME: Lecture: Mon /Wed 9:00 – 10:30
Lab: Fri 1:00-4:00

TELEPHONE: 867-668-8776

DATES: Sept. 2 – Dec. 7, 2020

COURSE DESCRIPTION

Biology 220 introduces the science of ecology by focusing on the interrelations between individual organisms, their populations and communities. The course begins by reviewing the factors that limit distributions and then considers population demography, life tables, regulation of natural populations and managing harvested populations. We briefly review some of the mathematical models to explain interspecific competition and predation. The course continues with an overview of community ecology and considers selected topics: succession, species diversity gradients, energy flow, biogeochemistry, and the role of predation, competition and disturbance in structuring communities. Finally, we conclude by considering the prospects for global change and the ecological processes that may shape these changes.

PREREQUISITES

BIOL 101 and 102 or equivalent; COMM 193 recommended.

RELATED COURSE REQUIREMENTS

Lectures during the Fall 2020 term will be held online using Zoom software so students will require a suitable computer with a stable internet connection. A headset with microphone is also recommended.

EQUIVALENCY OR TRANSFERABILITY

UBC	BIOL 230 (3)	TRU	BIOL 2170 (3)
UBCO	BIOL 201 (3)	UVIC	BIOL 215 (1.5)
SFU	BISC 204 (3)		

See https://bctransferguide.ca/ for an up to date list of transfers within BC. Further

information and assistance with transfers may be available from the School of Science.

LEARNING OUTCOMES

On successful completion of this course students will be able to:

- describe the ecological factors that affect the distribution and abundance of organisms;
- understand the interplay between evolution and ecology;
- construct simple life tables and interpret simple models of population growth, interspecific competition and predator-prey interactions;
- propose testable hypotheses along with experimental tests to resolve ecological questions.

COURSE FORMAT

Lectures: Three hours per week (2 classes of 1.5 hours). In response to the 2020 SARS Cov-2 pandemic our lectures will be delivered online using Zoom. This is a fast-paced course and students are strongly encouraged to attend lectures during the scheduled lecture time slot (i.e. synchronously) so they can ask questions and participate in class discussions. Efforts will be made to record and post the Zoom lectures online but students should participate in each class rather than relying on the video archive.

Labs: Three hours per week, face to face, with physical distancing and adjusted class size in effect. The 12 activities will include 4 tutorials focused on numerical problem sets, 2 field data collection exercises with formal lab reports and 5 seminars that will focus on critiquing papers or ideas in ecology.

ASSESSMENTS:

Attendance & Participation

Students are expected to attend both lectures and the scheduled activities (including field activities). Several of the lab exercises involve collecting data or making observations and this would make it difficult or impossible for students who miss the lab to complete the lab assignment. There is a strong correlation between regular attendance and academic performance.

Assignments

There will be several short take-home assignments and there will be a written assignment with each week's lab activity. Students must pass the field/lab portion of the course to receive a passing grade for the overall course.

Tests
Rather than a single midterm examination we will have two shorter quizzes. The final exam is scheduled for Wednesday, Dec. 9 from 9:00- noon; it will be comprehensive and cover all topics taken up during the term. If changes due to the SARS Cov-2 pandemic require a switch to online rather than face to face testing for the midterm or final exams then marks will be re-distributed according to *Plan B* in the table below.

EVALUATION:

		Plan B
Take home quiz / questions	5%	10%
Lab assignments	35%	50%
Midterm exams (2 @15% each)	30%	25%
Distance Learning Journal	5%	5%
Final Exam	25%	10%
Total	100%	100%

REQUIRED TEXTBOOKS AND MATERIAL
Molles, M..C. and Cahill, J.F. 2017. Ecology: Concepts and Applications – 4th Canadian Edition McGraw-Hill Ryerson 720 pp.

ACADEMIC AND STUDENT CONDUCT

Information on academic standing and student rights and responsibilities can be found in the current Academic Regulations that are posted on the Student Services/ Admissions & Registration web page.

PLAGIARISM

Plagiarism is a serious academic offence. Plagiarism occurs when a student submits work for credit that includes the words, ideas, or data of others, without citing the source from which

the material is taken. Plagiarism can be the deliberate use of a whole piece of work, but more frequently it occurs when students fail to acknowledge and document sources from which they have taken material according to an accepted manuscript style (e.g., APA, CSE, MLA, etc.). Students may use sources which are public domain or licensed under Creative Commons; however, academic documentation standards must still be followed. Except with explicit permission of the instructor, resubmitting work which has previously received credit is also considered plagiarism. Students who plagiarize material for assignments will receive a mark of zero (F) on the assignment and may fail the course. Plagiarism may also result in dismissal from a program of study or the University.

YUKON FIRST NATIONS CORE COMPETENCY

Yukon University recognizes that a greater understanding and awareness of Yukon First Nations history, culture and journey towards self-determination will help to build positive relationships among all Yukon citizens. As a result, to graduate from ANY Yukon University program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukonu.ca/yfnccr.

ACADEMIC ACCOMMODATION

Reasonable accommodations are available for students requiring an academic accommodation to fully participate in this class. These accommodations are available for students with a documented disability, chronic condition or any other grounds specified in section 8.0 of the Yukon University Academic Regulations (available on the Yukon University website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, they should contact the Learning Assistance Centre (LAC): lac@yukonu.ca.

TOPIC OUTLINE

Date	Topic	Concepts	Chapter
Sept. 2	Introduction, Hypothesis testing	def'n ecology, levels of organization, hypothesis testing, theme of temporal and spatial heterogeneity, proximate vs. ultimate explanations	Chapter 1
Sept. 7	**Labour Day**	**Holiday**	

Sept. 9	Land and Water	Biomes, water & temperature as master limiting factors, soil horizons, hydrological cycle, flux, turnover time, oceanic zonation (horizontal and vertical), still waters, zonation, lake turnover, isothermal , limits to distributions, abiotic and biotic factors, allelopathy	Chap 2 (skip pp 29-36), Chap 3 (skip 55-64, 68-74)
Sept. 14	Natural selection and evolution	Evolution, genetic drift, natural selection, adaptation, fitness, , phenotype, genotype, ecotypes, common garden expts., stabilizing selection, disruptive selection, directional selection	Chap 4
Sept. 16	Coevolution and speciation	Coevolution,, Mullerian and Batesian mimicry, Mayr's biological species concept,2 types of reproductive isolation – pre- and postzygotic isolating mechanisms, 3 types of speciation,	con'd
Sept. 21	Temperature relations	How do organisms respond to temperature? range of tolerance, heart budgets, ectotherms, endotherms, thermal neutral zone, 8 strategies for extreme conditions	Chap 5
Sept 23	Nutrient & energy relations	Energy sources, trophic classifications, light (PAR), 3 photosynthesis pathways by name, C:N ratios and challenges to herbivore diets,	Chap 7 (skip 181-183) (delay 187-191)
Sept 28	Behavioural ecology / Optimal foraging	Kin selection, inclusive fitness, costs & benefits of group living Foraging decisions, numerical & functional responses, optimal foraging theory and assumptions, diet width mode & predictions. , 3 types of functional responses	Chap 7 Read 187-191, Chapter 8
Sept. 30	Life History Patterns	Fundamental & realized niche, principle of allocation, trade-offs, life history classifications, r & K selection, principle of allocation, Grimes approach to plant life histories, disturbance, stress tolerance, Winemiller & Rose – 3 factors to classify life histories, climate change	Chap 9 up to page 246
Oct 5	Intro to Populations & Estimating density	(see Sept 11 notes where we introduced limits to dist'n), what is an individual: unitary, modular organisms, genet, ramet; patterns of dist'n: random, regular clumped, def'n of pop'n, metapopulation, relative and absolute abundance	Chap 10
Oct 7	Population Structure	Intro to life tables, mortality, static and cohort life tables, n_x, l_x, d_x, q_x, 3 types of survivorship curves, fecundity schedules, net reproductive rate	Chap 11
Oct. 12	**Thanksgiving Monday**	**Holiday**	
Oct. 14	Pop'n Structure (continued)	Generation time, T, actual or realized *r,* dispersal, jump dispersal , sex ratios & frequency dependent selection,	con'd
Oct 19	Population Growth	Density dependent and independent birth and death rates , , lambda - geometric rate of increase, exponential growth using dN/dt = *r*N, eq'n for logistic pop'n growth, assumptions of models, realized *r* vs r_{max}	Chapter 12
Oct. 21	Population Growth	Conclude pop'n growth section	

Oct 26	Competition – Intraspecific & Interspecific	Types of spp interactions, exploitation or resource competition, interference competition, impacts of competition on growth, survival and reproduction, Lotka-Volterra model of interspecific comp. and how to interpret LV graphs, comp. coefficients	Chap 9 – p 247-251; Chap 13 (skip 357-358)
Oct. 28	Intro to Herbivory & Predation	Types of predation, impacts of exploitation on individuals and populations, invasive spp and enemy release hypothesis, LV-predation equations, coupled oscillations, neutral stability, Huffaker's case history showing role of prey refuges, other ways to escape predators	Chap 14
Nov. 2	Exploitation, Predation and Harvesting populations	Recruitment curves, role of intraspecific comp in determining shape of curve, maximum sustainable yield, fixed quotas harvests, managing harvest effort	pp. 325-327
Nov. 4	Mutualism & Parasitism	Parasites can affect behaviour; winter ticks and moose, flour beetles and competition affected by parasites. Plant-ant protection mutualisms	Chapter 15 – up to page 407
Nov. 9	Community structure and function	Emergent properties of communities, species abundance, spp diversity, role of disturbance, conclude spp diversity & disturbance	Chapter 16
Nov 11	**Remembrance Day**	**Holiday**	
Nov. 16		*Buffer – topic TBD*	
Nov 18	Food webs & keystone species	Review 2nd midterm . Who eats who? Food webs. Why are food chains short (2 hypotheses), Keystone species vs dominant spp, ecosystem engineers	Chapter 17 (skip 17.2)
Nov. 23	Community succession	Primary & secondary succession, climax, patterns in succession, Connell & Slatyer model of succession. Facilitation, inhibition & tolerance,	Chapt 18 (skip p 490-492)
Nov. 25	Community stability	Disturbance & stability, resilience and resistance – Park Grass expt	con'd
Nov. 30	Energy flow	Primary production, GPP, NPP, limits to NPP in terrestrial and aquatic systems, tropic cascades , Top down or bottom up control,	Chapter 19
Dec. 2	Patterns in Species Richness - Macroecology	Island Biogeography - Equilibrium model of biogeography, immigration & extinction rates	Chapter 22 (skip Sect 22.1)
Dec 7.	Continued	Gradients in species richness , hypotheses to explain patterns, detailed evaluation of hypotheses to explain latitudinal patterns	Chapter 22
Dec. 8 Tues	Ecology & Global Change	Course review & highlights – themes and integration. Make up lecture for Thanksgiving Monday	pp 574-581

Lab Schedule

Sept. 4	#1 Tutorial: Hypothesis Testing in Ecology	Due Sept 11
Sept. 11	#2 Lab Exercise: Decomposition and Forest Soil CO_2 Emissions	TBD… in early Oct.
Sept. 18	#3 Seminar: Natural Selection question	Due before lab
Sept 25	#4 Life Table Analysis Tutorial	Oct 2
Oct. 2	#5 Lab Exercise: Population estimate using mark recapture	TBD
Oct. 9	**Quiz #1**	
Oct. 16	#6 Seminar – Human Impacts on Ecosystems	Due before lab
Oct. 23	#7 Seminar – Critique of paper (Loons or Eels)	Due before lab
Oct. 30	#8 Tutorial: Harvesting Populations	Due Nov 6h
Nov. 6	**Quiz #2**	TBD
Nov. 13	#9 Seminar: Keystone Species	Due before lab
Nov. 20	#10 Seminar: Critique of paper snail paper or Eider ducks	Due before lab
Nov. 27	#11 TBD	
Dec. 4	#12 Review session – answering exam-type questions in groups	