DIVISION OF APPLIED SCIENCE & MANAGEMENT
BIOL 220
School of Science
Fall, 2018

COURSE OUTLINE

BIOL 220

ECOLOGY

45 **HOURS**
3 **CREDITS**

PREPARED BY: _____ DATE: _____
Scott Gilbert, Instructor

APPROVED BY: _____ DATE: _____
Margaret Dumkee, Dean

APPROVED BY ACADEMIC COUNCIL: (date)

RENEWED BY ACADEMIC COUNCIL: (date)

The Course Outline Template is approved by the Academic Council on June 20, 2018

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ECOLOGY

INSTRUCTOR: Scott Gilbert, B.Sc., Ph. D.	**OFFICE HOURS:** Tues & Thurs 11:00-noon or by appointment
OFFICE LOCATION: A2515	**CLASSROOM: Lecture** A2204 **Lab** A2103
E-MAIL: sgilbert@yukoncollege.yk.ca	**TIME: Lecture:** Tues & Thurs, 9 -10:30am **Lab:** Friday 1-4 pm (A2103)
TELEPHONE: (867) 668-8776	**DATES:** Sept 6 - Dec 20, 2018

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

EQUIVALENCY/TRANSFERABILITY

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

See the website http://bctransferguide.ca/ for a more complete list of transfers within BC.

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.

DELIVERY METHODS/FORMAT

Lectures will be supplemented by practical exercises during a weekly lab to illustrate ecological principles and by seminars in which students will discuss ecological problems and ideas.

COURSE FORMAT

LECTURES: Three hours per week (2 classes of 1.5 hours)

LABS: Three hours per week - a total of 12 activities will include 4 tutorials focused on numerical problem sets, 3 data collection exercises (2 field based and 1 classroom based) that may include formal lab reports and 5 seminars that will focus on critiquing papers in ecology.

COURSE REQUIREMENTS

ASSESSMENTS

Attendance

This is a fast-paced course that covers a wide variety of topics and students are strongly encouraged to attend lectures. Most of the labs and all of the seminars require attendance and participation if students wish to receive a grade for that exercise. There is a strong correlation between regular attendance and academic performance in this course.

ASSIGNMENTS & TESTS

Most lectures will start with a 3-minute quiz at the beginning of class to assess understanding of the previous lecture. This will reward students who show up to class on time and review their lecture notes and readings. Instead of one major mid-term there will be two 60 minute quizzes during the term; the first quiz will be scheduled after a month of classes to give students early feedback on their progress. Students must pass the field/lab portion of the course if they wish to receive a passing grade for the overall course. The final exam will be scheduled by the Registrar's office for a date in December and will be comprehensive and cover all topics taken up during the term.

Class participation quizzes	5
Mid-term tests (2 @ 15%)	30
Field/lab activities	35
Final examination	30
Total	**100**

REQUIRED TEXTBOOKS/MATERIALS

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 & Regulations 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 College.

YUKON FIRST NATIONS CORE COMPETENCY

Yukon College 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 College program, you will be required to achieve core competency in knowledge of Yukon First Nations. For details, please see www.yukoncollege.yk.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 College Academic Regulations

(available on the Yukon College website). It is the student's responsibility to seek these accommodations. If a student requires an academic accommodation, he/she should contact the Learning Assistance Centre (LAC) at (867) 456-8629 or lac@yukoncollege.yk.ca.

TOPIC OUTLINE / SYLLABUS

Date	Topic	Concepts	Chapter
Sept. 6	Introduction, Hypothesis testing	def'n ecology, levels of organization, hypothesis testing, theme of temporal and spatial heterogeneity, proximate vs. ultimate explanations	Chapter 1
Sept. 11	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. 13	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. 18	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. 20	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 25	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 27	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
Oct 2	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 4	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 9	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. 11	Pop'n Structure (continued)	Generation time, T, actual or realized *r,* dispersal, jump dispersal , sex ratios & frequency dependent selection,	con'd
Oct 16	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. 18	Population Growth	Conclude pop'n growth section	

Oct 23	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. 25	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
Oct 30	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. 1	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. 6	Community structure and function	Emergent properties of communities, species abundance, spp diversity, role of disturbance, conclude spp diversity & disturbance	Chapter 16
Nov. 8		*Buffer – topic TBD*	
Nov 13	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. 15	Community succession	Primary & secondary succession, climax, patterns in succession, Connell & Slatyer model of succession. Facilitation, inhibition & tolerance,	Chapt 18 (skip p 490-492)
Nov. 20	Community stability	Disturbance & stability, resilience and resistance – Park Grass expt	con'd
Nov. 22	Energy flow	Primary production, GPP, NPP, limits to NPP in terrestrial and aquatic systems, tropic cascades , Top down or bottom up control,	Chapter 19
Nov. 27	Patterns in Species Richness - Macroecology	Island Biogeography - Equilibrium model of biogeography, immigration & extinction rates	Chapter 22 (skip Sect 22.1)
Nov 29	Continued	Gradients in species richness , hypotheses to explain patterns, detailed evaluation of hypotheses to explain latitudinal patterns	Chapter 22
Dec. 4	Ecology & Global Change	Course review & highlights – themes and integration. [Habitat frag.]	pp 574-581

Biology 220 *Draft* Laboratory Schedule - *June 2018*

Sept. 7	#1 Tutorial: Hypothesis Testing in Ecology	Due Sept 14
Sept. 14	#2 Lab Exercise: Decomposition and Forest Soil CO_2 Emissions	TBD… in early Oct.
Sept. 21	#3 Seminar: Natural Selection question	Due before class
Sept 28	#4 Life Table Analysis Tutorial	TBD
Oct. 5	#5 Lab Exercise: Population estimate using mark recapture	TBD
Oct. 12	**Quiz #1 //** then continue work on Lab #5	
Oct. 19	#6 Seminar – Human Impacts on Ecosystems[1]	Due before class
Oct. 26	#7 Seminar – Critique of paper (Loons or Eels)[2]	Due before class
Nov. 2	#8 Tutorial: Harvesting Populations[3]	Due Nov 4th
Nov. 9	**Quiz #2 1:00 PM //** Then #9 Lab Exercise: Population Interaction	TBD
Nov. 16	#10 Seminar: Keystone Species	Due before class
Nov. 23	#11 Seminar: Critique of paper snail paper[4] or Eider ducks or [5]	Due before class
Nov. 30	#12 Review session – answering exam-type questions in groups	No assignment

[1] Read 3 papers :
Stokstad, E. 2014. The empty forest. (Vanishing Fauna/ Special Section). Science (345) 6195: 396- 400;
Redford, K.H. 1992. The empty forest. BioScience (42) 6: 412- 422; and
Dirzo, R., H.S.Young, M. Galetti, G.Ceballos, N.J.B. Isaac, B. Collen. 2014. Defaunation in the Anthropocene. Science (345) 6195: 401-406.

[2] Dickson, Lynne 1992. The Red-throated Loon as an indicator of environmental quality. Canadian Wildlife Service, Occasional Publication No. 73.
Marcogliese , Lucian A., Casselman, John M. and Hodson , Peter V. 1997. Dramatic declines in recruitment of American Eel (*Anguilla rostrata*) entering Lake Ontario -- Long-term trends, causes and effects. *Plenary presentation at the 3rd National EMAN Meeting, Saskatoon, Saskatchewan, 22 January 1997*

[3] Readings from Pauly, D. V. Christensen, S. Guénette T.J. Pitcher, U.R. Sumaila, C.J. Walters, R. Watson and D. Zeller**.** 2002. Toward sustainability in world fisheries. Nature 418: 689-695

[4] Hershey, Anne 1990. Snail populations in Arctic lakes: Competition mediated by predation? Oecologia 82: 26-32.

[5] Reed, J.A., D.L. Lacroix and P.L. Flint 2007. Depradation of Common Eider, *Somateria* mollissima, Nests on a Central Beaufort Sea Barrier Island: A Case Where No One Wins. *Can. Field-Nat. 121*: 308-312.