Douglas College

EFFECTIVE: SEPTEMBER 2007
CURRICULUM GUIDELINES

A. Division: **Education** Effective Date: **September 2007**

B. Department / Program Area: **Science and Technology**
Biology

Revision [ ] New Course [X]

If Revision, Section(s) Revised:
Date of Previous Revision:
Date of Current Revision:

C: **BIOL 3305** **D**: **Ecology** **E:** **5**

Subject & Course No. | Descriptive Title | Semester Credits

F: Calendar Description:

A study of the interaction of living organisms with biotic and abiotic aspects of their environment. Population, community and ecosystem ecology are examined along with a consideration of topics in evolutionary ecology like life history theory, mating systems and social behaviour. The course also investigates conservation of biological diversity and the impact of human activities on natural systems.

G: Allocation of Contact Hours to Type of Instruction / Learning Settings

Primary Methods of Instructional Delivery and/or Learning Settings:

Lecture/Tutorial/Laboratory/Field trip

Number of Contact Hours: (per week / semester for each descriptor)

Lecture/Tutorial 4 hours/week
Laboratory/Field trip 4 hours/week

Number of Weeks per Semester:

15

H: Course Prerequisites:

BIOL 1210 or BIOL 1310 or permission of the instructor

I: Course Corequisites:

none

J: Course for which this Course is a Prerequisite

none

K: Maximum Class Size:

27

L: PLEASE INDICATE**:**

[ ] Non-Credit
[ ] College Credit Non-Transfer
[X] College Credit Transfer:

SEE BC TRANSFER GUIDE FOR TRANSFER DETAILS (www.bctransferguide.ca)

M: Course Objectives / Learning Outcomes

Upon completion of this course, the student will:

1. Be able to describe the biotic and abiotic components of terrestrial, marine and fresh water environments.
2. Be able to describe the flow of energy through ecosystems with reference to trophic levels and ecological efficiency.
3. Understand the cycling of nutrients through ecosystems.
4. Be able to demonstrate how an evolutionary ecology approach can be used to analyze life histories, sexual reproduction, sex ratios, mate choice, and social and altruistic behaviour.
5. Be able to describe population structures, growth and the factors that limit the distribution and abundance of populations.
6. Understand the various interspecific interactions including competition, predation, and mutualism and related evolutionary responses.
7. Be able to describe community structure and the dynamics of community organization and change including the process of ecological succession.
8. Be able to use general principles of ecology to analyze human impacts on ecosystems.
9. Understand the principles of field sampling and be able to conduct field research using a variety of sampling techniques.
10. Be able to interpret field results, perform simple statistics and write reports.
11. Research and write a major report on an ecological topic, and communicate the results in an oral presentation and/or poster.

N: Course Content:

The major topics in the course include the following:

1. Introduction to Ecology
   - 1.1. The scientific method
   - 1.2. Ecology and the levels of the Biosphere
   - 1.3. Ecology, evolution and adaptation
2. Biotic and abiotic aspects of the environment
   - 2.1. The physical environment
   - 2.2. The biotic environment
   - 2.3. Populations, communities and ecosystems
   - 2.4. Terrestrial, freshwater and marine ecosystems
   - 2.5. Biomes
3. Energy flow and nutrient cycles
   - 3.1. Food chains and trophic levels
   - 3.2. Food webs
   - 3.3. Ecological efficiency
   - 3.4. Nutrient cycling and regeneration
4. Life history theory
   - 4.1. The principal of allocation
   - 4.2. Life-history trade-offs
   - 4.3. Phenotypic plasticity
   - 4.4. Senescence

5. Evolution of sexual reproduction
   - 5.1. Sex ratios
   - 5.2. Female choice and mating systems
   - 5.3. Sexual selection

6. Social behaviour
   - 6.1. Costs and benefits of social behaviours
   - 6.2. Kin selection and altruism
   - 6.3. Game theory and cooperative behaviour
   - 6.4. Parent-offspring conflict
   - 6.5. Evolution of eusociality

7. Population ecology
   - 7.1. Density and dispersion
   - 7.2. Estimation of population density
   - 7.3. Exponential and logistic growth
   - 7.4. Age structure and life tables
   - 7.5. Density-dependent and independent factors
   - 7.6. Metapopulations

8. Predation, parasitism and herbivory
   - 8.1. Adaptations of predators (parasites, herbivores) and prey (hosts, plants)
     - 8.1.1. Prey location, selection, capture and assimilation
     - 8.1.2. Predator avoidance, escape and defence
   - 8.2. Predator-prey population dynamics
   - 8.3. Functional and numerical response

9. Competition
   - 9.1. Interspecific and intraspecific competition
   - 9.2. Competitive exclusion
   - 9.3. Resource partitioning
   - 9.4. Exploitation and interference competition
   - 9.5. Logistic model and competition

10. Coevolution
    - 10.1. Reciprocal evolutionary response
    - 10.2. Coevolution in antagonistic interactions
    - 10.3. Coevolution in mutualistic interactions

11. Community ecology
    - 11.1. Community structure
    - 11.2. Food webs
    - 11.3. Abundance-diversity indices
    - 11.4. Ecological succession

12. Biological diversity & conservation biology
    - 12.1. Global patterns of biological diversity
    - 12.2. Species area-relationships
    - 12.3. Island biogeography theory
    - 12.4. Metapopulation theory
    - 12.5. Ecological theory and the design of ecological reserves

13. Environmental issues and resource management
    - 13.1. Environmental impact assessments
    - 13.2. Persistence and toxicity of pollutants
    - 13.3. Integrated pest management
    - 13.4. Toxic waste, acid rain, air pollution
    - 13.5. Global warming

14. Field techniques
    14.1. Soil analysis
    14.2. Plant/animal identification
    14.3. Quadrat/belt transect analysis
    14.4. Lake/stream analysis
    14.5. Intertidal sampling

DOUGLAS COLLEGE SIGNATURE ELEMENTS:

Core Competencies:

a. Oral, written and interpersonal communication:
In-class assignments, term papers and all examinations in this course will include writing. Term projects will include an oral presentation. Students will work collaboratively in groups on term projects, lab and field activities and classroom assignments.

b. Computational and Information Technology
Students will use computer technology for all research activities associated with term projects, laboratory and field activities and reading assignments. Computer analysis of field collected data will be done for all field exercises.

c. Critical and Creative Thinking
Critical thinking will be essential in analysis of ecological questions in class, lab and field activities, and in term projects.

d. Teamwork
Students will work in groups on in-class analysis of ecological problems, discussion of literature papers, collection of analysis of lab and field-collected data.

Academic Signature:

a. Applied Skills (field, laboratory practicum)
Students will learn a wide range of laboratory and field skills typical of ecological investigation.

b. Ethical behaviour and social responsibility
Discussion of ethics and social responsibility will occur regarding many issues in the course including the social responsibility of scientists, the impacts of humans on ecological systems and human-induced loss of biological diversity.

c. Intercultural, International and Global Perspective
Many issues in the course have a global perspective as all biological organisms are subject to evolutionary change. Many ecological examples will be presented from numerous countries and parts of the world.

O: Methods of Instruction

This course involves 4 hours per week of classroom instruction and four hours per week of laboratory activity or field trip. Classroom work will include lectures and tutorials, and is integrated with textbook and scientific journal readings. Field trips and laboratory activities complement and enhance understanding of the theory content of the course.

P: Textbooks and Materials to be Purchased by Students

Smith, R.L. & Smith, T.M. (2001) Ecology & Field Biology, Sixth Edition.
Benjamin Cummings, Pearson Education, Newmarket, Ontario, Canada
OR
Ricklefs, R.E. (2001) The Economy of Nature, Fifth Edition.
W.H. Freeman and Company Publishers, New York, NY, USA
OR
A current ecology text, as specified by the instructor will be required.

Q: Means of Assessment

Class Tests & Assignments	10-20%
Lab & Field Trip Reports	10-20%
Term Project	10-20%
Midterm examination	20-30%
Final examinations	25-35%
TOTAL	100 %

GRADES: **A+** 95-100 **A** 90-94 **A-** 85-89 **B+** 80-84 **B** 75-79
B- 70-74 **C+** 65-69 **C** 60-64 **C-** 55-59 **P** 50-54 **F** 0-49

R: Prior Learning Assessment and Recognition: specify whether course is open for PLAR

There is no provision for PLAR, other than that normally done by examining transcripts and comparing course outlines of biology courses taken within the last five years to the Biology 3305 course content.

Course Designer(s): Rob McGregor

Education Council / Curriculum Committee Representative

Dean / Director: Des Wilson

Registrar