

M: Course Objectives / Learning Outcomes

1. To understand the mechanisms and processes of biological evolution
2. To develop an appreciation of the development of evolutionary thought in the biological sciences
3. To explain the major lines of evidence for biological evolution
4. To understand the population genetics underlying evolutionary theory
5. To understand the requirements for and causes of natural selection and the biological levels at which selection can act
6. To explain current theories of the origins of life and evolution of cellular organisms and the genetic code
7. To apply evolutionary analysis to the study of life histories, sexual reproduction, sociality, speciation, extinction, human evolution, human medicine, environmental issues and other biological topics

N: Course Content:

1. History of evolutionary thought
 - 1.1. Early history
 - 1.2. Darwin
 - 1.3. The modern synthesis
 - 1.4. Contemporary views
2. The evidence for evolution
 - 2.1. Phylogenetic trees
 - 2.2. Homology and analogy
 - 2.3. The fossil record
 - 2.4. Biogeography
 - 2.5. Measurement of evolutionary change
 - 2.6. Cell and molecular biology
3. Mechanisms of evolution
 - 3.1. Sources of variation
 - 3.2. Natural selection
 - 3.3. Genetic drift
 - 3.4. Gene flow
4. Population genetics
 - 4.1. Hardy-Weinberg equilibrium
 - 4.2. Selection on dominant and recessive alleles
 - 4.3. Mutation-selection balance
 - 4.4. Non-random mating
 - 4.5. Linkage equilibrium and disequilibrium
5. Natural selection and the levels of selection
 - 5.1. Requirements for natural selection
 - 5.2. Causes of selection
 - 5.3. Measurement of selection
 - 5.4. Levels of selection
6. Origins of life
 - 6.1. Miller-Urey experiment
 - 6.2. RNA world
 - 6.3. Protobionts
 - 6.4. Common origin of all organisms

7. Molecular evolution and the evolution of genetic systems
 - 7.1. Evolution of the genetic code
 - 7.2. DNA sequence evolution
 - 7.3. Natural selection on DNA sequences
 - 7.4. Transposable elements
 - 7.5. Organelle genomes
8. Evolution of life histories
 - 8.1. Life history traits
 - 8.2. Major evolutionary trade-offs
 - 8.3. Evolution of aging
9. Evolution of sexual reproduction
 - 9.1. Sexual vs. asexual reproduction
 - 9.2. Female choice
 - 9.3. Sexual selection
 - 9.4. Evolution of mating systems
10. Evolution of sociality
 - 10.1. Kin selection
 - 10.2. Eusociality
 - 10.3. Evolution of sex ratio
 - 10.4. Parent-offspring conflict
 - 10.5. Reciprocal altruism
11. Speciation and extinction
 - 11.1. Mechanisms of reproductive isolation and hybrid zones
 - 11.2. Adaptive radiation
 - 11.3. Macroevolution and the history of life
12. Human evolution
 - 12.1. Origin of modern humans
 - 12.2. Evolution of human behaviour
13. Darwinian medicine
 - 13.1. Evolution of human pathogens
 - 13.2. Evolution of human response to disease
14. Evolution and the environment
 - 14.1. Evolutionary ecology
 - 14.2. Biological diversity & biological invasions
 - 14.3. Global warming and adaptation
 - 14.4. Drug and pesticide resistance

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 in groups in classroom assignments.
- b. Computational and Information Technology
Students will use computer technology for all research activities associated with term projects and reading assignments.
- c. Critical and Creative Thinking:
Critical thinking will be essential in analysis of evolutionary questions in class and in term projects.

- d. Teamwork:
Students will work in groups on in-class analysis of evolutionary problems and discussion of literature papers.

Academic Signature:

- a. Applied skills (field, laboratory practicum):
Students will learn to apply evolutionary analysis to a variety of biological problems.
- b. Ethical behaviour and social responsibility:
Discussion of ethics and social responsibility will occur regarding many issues in the course including the creation vs. evolution debate, evolution of drug and pesticide resistance, loss of biological diversity, biological exploration for profit, global warming, etc.
- 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 examples of evolution will be presented from numerous countries and parts of the world. Discussions re. the evolution of human culture and behaviour will foster an intercultural perspective.

O: Methods of Instruction

Lecture
Discussion groups
Reading assignments
Term projects

P: Textbooks and Materials to be Purchased by Students

Will be decided by course instructors. Potential resources include:

S. Freeman & J.C. Herron, (2004), Evolutionary Analysis 3rd edition. Pearson Education, Newmarket, Ontario, Canada.

Q: Means of Assessment

In-class assignments and tests	15-25%
Term project	15-25%
Midterm examination	20-25%
Final examination	30-35%
Total	100%

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

Not at this time

Course Designer(s): Rob McGregor

Education Council / Curriculum Committee Representative

Dean / Director: Des Wilson

Registrar