

**MIAMI DADE COLLEGE  
SCHOOL OF EDUCATION  
COURSE SYLLABUS**

**EVOLUTION**

*This syllabus, course calendar, and other attending documents are subject to change during the semester in the event of extenuating circumstances.*

**Course Prefix & Number:** PCB 4674  
**Credit Hours:** Three (3)  
**Prerequisites:** BOT 3015, BOT 3015L, ZOO 3021, ZOO 3021L  
PCB 3043, BCH 3023, BCH 3023L. PCB 3060  
**Date & Time:** TBA  
**Professor Information:** TBA

**I. COURSE DESCRIPTION**

Designed specifically for students pursuing a bachelor's degree in secondary science education. Students explore evolutionary theory and its significance to all fields of modern biology including the theory of natural selection, the evidence for evolution, microevolution, speciation, macroevolution, the origin of life on Earth, major evolutionary trends, and the evolution of humans and culture.

Prerequisites: BOT 3015, BOT 3015L, ZOO 3021, ZOO 3021L, PCB 3043, BCH 3023, BCH 3023L, PCB 3060-

**II. COURSE COMPETENCIES & OBJECTIVES**

Competency 1: The student will demonstrate knowledge of the origins of hereditary variations by:

- 1.1. describing the role played by the rediscovery of Mendel's work, as well as the contributions of other geneticists, in strengthening Darwin's theory of natural selection.
- 1.2. explaining the significance of the chromosomal theory of inheritance to the emergence of Neo-Darwinism.

Competency 2: The student will demonstrate knowledge of the relationships among processes of change and the time element by:

- 2.1 describing examples where evolution in both the short-term and long-term have been identified.

Competency 3: The student will demonstrate knowledge of processes of microevolution, mutation, genetic drift, and natural selection by:

- 3.1 describing the meaning of microevolution and its significance to modern evolutionary theory.
- 3.2 identifying the mechanisms that bring about changes in the allele frequencies of populations (mutation, genetic drift, gene flow, non-random mating and natural selection) and evaluating their relative significance.

3.3 explaining how the various mechanisms of microevolution function to bring about change in the allele frequencies of populations.

Competency 4: The student will demonstrate knowledge of processes that influence diversity in molecular, anatomical, and behavioral characteristics of different organisms by:

4.1 describing how the external environment and genetic processes determine characteristics of organisms.

Competency 5: The student will demonstrate knowledge of the relationship between population genetics and evolution by:

5.1. evaluating the importance of population genetics to the development of the “New Synthesis.”

5.2. identifying the significance of the Hardy-Weinberg theorem to population genetics and to our present-day understanding of microevolution.

Competency 6: The student will demonstrate knowledge of the concept of speciation and of the factors that may contribute to the development of new species by:

6.1. describing and discussing the limitations of the biological species concept, and distinguishing among the several alternative species concepts (e.g. - ecological, pluralistic, morphological, and genealogical).

6.2. defining and differentiating the processes of allopatric and sympatric speciation.

6.3. identifying and understanding the various types of barriers that may arise and act as reproductive isolating mechanisms in the process of speciation.

6.4. comparing and contrasting artificial and natural selection; describing and giving examples of the different modes of natural selection.

Competency 7: The student will demonstrate knowledge of macroevolution and of the major environmental factors affecting it by:

7.1. comprehending the irreversible nature of macroevolution.

7.2. understanding the significance of biogeography in tracing the history of life on the planet, and describing how plate tectonics and continental drift have influenced biological diversity.

7.3. describing and give examples of major macroevolutionary patterns, such as divergence, adaptive radiation, convergence, and co-evolution.

7.4. recognizing that developmental studies offer insights into phylogenetic relationships.

7.5. defining and explaining the significance of extinction, understanding that evolution is not goal oriented, and discussing the terms success, progress, primitive, and derived, as they relate to evolution.

7.6. comparing and contrasting the two schools of thought regarding the tempo of evolution, i.e., “gradualism” and “punctuated equilibrium.”

Competency 8: The student will demonstrate knowledge of the theories of the origin and development of early life on Earth by:

8.1. identifying and discussing the scientific merits of the various theories that attempt to account for the diversity of life on the planet, such as evolution, creationism, **intelligent design**, and cosmic origin.

8.2. demonstrating understanding of the hierarchy of life and its relationship to the abiotic world.

- 8.3. discussing the main theories that address the mechanisms by which life is believed to have first evolved from non-life on Earth (e.g., Francesco Redi's refutation of the theories of spontaneous generation and the Oparin-Miller theory).
- 8.4. describing the origin of self-replicating systems and protocells.
- 8.5. describing the major landmarks in the evolution of the earliest life forms, including the endosymbiotic origin of eukaryotes and photosynthetic organisms.
- 8.6. demonstrating knowledge of the major trends in the evolution of life on Earth, such as multicellularity and sexual reproduction.
- 8.7. identifying and analyzing the effects of organic evolution on the planet, such as the oxygen revolution, the creation of fossil fuels, and the formation of soil.

Competency 9: The student will demonstrate knowledge of hominid evolution by:

- 9.1. tracing the evolution of the hominids, beginning with the first primates, and explaining their relationship to prosimians, simians, and hominoids.
- 9.2. discussing the australopithecines and their relationship to humans.
- 9.3. listing and describing the species of the genus *Homo*, characterize their phylogenetic relationships, and identifying those characteristics that distinguish *Homo sapiens* from other hominids.
- 9.4. comparing and contrasting the two major hypotheses that have been proposed to explaining the origin of modern humans (i.e., the "out of Africa" hypothesis and the "multiregional" hypothesis).
- 9.5. defining cultural evolution and identifying and discussing the major landmarks of this process.
- 9.6. explaining the relationship of cultural evolution to society's ability to alter its environment.

Competency 10: The student will demonstrate knowledge of **the history of** evolutionary thinking and the evidence for evolution by:

- 10.1. defining evolution and discussing the reasons why evolutionary theory was not widely accepted when it was first proposed.
- 10.2. explaining how the intellectual climate of Darwin's day was influenced by philosophers and scientists such as Plato, Aristotle, Carolus Linnaeus, Georges Cuvier, James Hutton, Charles Lyell, Jean Baptiste Lamarck, and Thomas Malthus.
- 10.3. relating events in Darwin's early life that prepared him to become a naturalist, describing the voyage of the H.M.S. Beagle, and identifying the types of information gathered by Darwin on that voyage that helped him formulate his theory of natural selection.
- 10.4. outlining the theory of natural selection as proposed by Charles Darwin and Alfred Wallace, discussing its significance as a mechanism of evolutionary change, and describing the initial reaction to it by scientists and the general public.
- 10.5. describing how natural selection functions to adapt populations to their environment by citing and explaining several examples.
- 10.6. identifying and analyzing the evidence gathered by Darwin and others that supports the idea that species change over time and has led to evolutionary theory becoming central to all fields of modern biology.

Competency 11: The student will demonstrate knowledge of nature and applications of scientific processes, limitations and the inquiry-based nature of science as it relates to the study of evolution by:

- 11.1. stating the basic principles of the scientific method, describing how they are applied to evolutionary theory and investigation.

### **III. REQUIRED TEXTBOOK(S), RESOURCES AND MATERIALS**

Freeman and Herron. **Evolutionary Analysis. 3<sup>rd</sup> Edition.** ISBN# 0-13-144279-1.

Companion website at: [www.prenhall.com/freeman/evolution](http://www.prenhall.com/freeman/evolution)

Note: The final textbook will be chosen on the basis of its coverage of course competencies and objectives.

### **IV. SUPPLEMENTARY READING AND REFERENCES**

Placed on reserve at the reserve desk of the campus library:

- Readings and references materials
- Current textbook

### **V. TECHNOLOGY/AUDIO/VIDEO**

Placed on reserve at the reserve desk of the campus library:

- Audio/video materials
- Software

### **VI. SUPPLIES**

Required and optional supplies will be announced during first week class.

### **VII. METHODS OF INSTRUCTION**

Instruction and student interaction may include but not be limited to: lecture, group projects, class discussion, collaborative and cooperative learning, case studies, role-playing, simulations, problem-based learning, fieldtrips, hands-on activities, student presentations, and the use of technology.

### **VIII. COURSE REQUIREMENTS AND EXPECTATIONS**

#### **A. ATTENDANCE AND WITHDRAWAL POLICY**

Students are expected to attend every class. The instructor will keep a record of class attendance. It is the student's responsibility to notify the instructor in advance of, or immediately following, any unplanned absence. It is the instructor's prerogative to withdraw students with more than three unexcused absences.

#### **B. ASSIGNMENTS**

**A. Writing assignments (15% of grade)** – Instructor may identify required and / or optional assignments or allow students to choose some number of assignments from this listing.

1. **Persuasive Essay**

- a. Write a persuasive essay explaining the scientific basis for biological evolution.
  - b. Be sure to include in your essay scientific facts to support your statements.
  - c. The essay will be graded based on a scoring rubric that will be distributed in class before you begin writing.
2. **Videotape study guide** – complete study guide questions for an evolution-related videotape in the campus Computer Courtyard, Campus Library or Public Library
  3. **Videotape study guide creation** – create a 20 question study guide for an evolution-related videotape in the campus Computer Courtyard, Campus Library or Public Library. Create an answer key for the questions.
  4. **Create an Electronic Presentation** - research and prepare a concise, professional and informative classroom presentation using Power Point. It is not necessary to present your project to the class.
  5. **Create a Concept Map** - “Concept mapping is a learning tool developed at Cornell University to promote memory retention: (Taylor, Martha R. *Student Study Guide for Campbell’s Biology*, 2<sup>nd</sup> edition). Users of concept mapping agree that concept mapping is one of the most powerful study techniques available because it helps students organize and structure information to increase understanding.
    - i. *A good concept map diagram is particularly useful because it “shows the organization of ideas and the relationship among concepts in a particular subject area” (Taylor). Simply stated, a concept map is a “diagram that links general ideas or principles into a coherent whole so as to facilitate understanding” (Wilson, Dr. Larry, Power Study Technique No. 1: Concept Mapping ).*
    - ii. *So, prepare your own concept map for any textbook Chapter included in the readings for the course. You may wish to visit [www.inspiration.com](http://www.inspiration.com) for a free trial of a highly-rated concept mapping software program.*
  6. **Broadcast Media Report** - Watch a TV show or listening to a radio broadcast of a program with evolution-related content. Complete an analysis of the program and relate it to specific course objectives.
  7. **Evolution Critical Article Review Project – get an evolutionary journal or similar article from your Instructor. In 2-3 word-processed pages,**
    - i. briefly summarize the article including descriptions of: who? what? why? when? where?, etc.
    - ii. Which of the fields of evolution relate to the article?
    - iii. How do the issues discussed in the article relate to the course and are they important to anyone other than the author? Why ?
    - iv. Prepare a title page with:
      - v. The full title and source of the article (name, date, etc.)
      - vi. PCB 4674 – Evolution
      - vii. Your name & date submitted
      - viii. Simply staple the pages together and turn them in to me by the due date in the Course Calendar.

**B. Presentation (15% of grade)**

- a. Create and deliver a 15-20 minute oral presentation related to a mutually agreed upon evolutionary topic. Your presentation must contain at least 5 scientific facts related to your topic and you are encouraged to use the available classroom technology. Presentation details and a grading rubric will be provided to you. Presentations will be scheduled during the weeks the topic is covered in class.

**C. GRADES**

Your final grade will be based on the following information:

1. Four exams (50%)
  - o quizzes and exams may include, but not be limited to, true/false, multiple choice, short answer and / or essay questions
2. One comprehensive final exam (FEAP Task 8e) (20%)
3. Writing assignment(s) (15%)
4. Presentation (15%)

**D. GRADING SCALE**

- A: 90-100
- B: 80-89
- C: 70-79 (minimum passing score)
- D: 60-69 (must repeat course)
- F: 0-59 (must repeat course)

A grade of I (incomplete) can be assigned only under the following conditions.

1. The student requests the grade of incomplete.
2. The student has completed all exams up to that time with the possible exception of the last unit exam and/or final exam.
3. The student has completed all assignments up to that time.
4. The student has at least a C average up to that time.
5. The circumstances that prevent the student from completing the course by the end of the term must be extenuating and documentable.
6. The student must agree to make up the missing work by the date specified by the instructor or by the end of the next major term, whichever is earlier. This agreement must be formalized by completing the College's *Agreement for a Grade of Incomplete* form.

**IX. ALTERNATE INSTRUCTION/LEARNING SUPPORT CENTERS**

Students who need help completing assignments or with work in-class are encouraged to seek help at the support center on their campus.

**X. AMERICANS WITH DISABILITY ACT (ADA) STATEMENT:**

Students who have a disability that might affect their performance in this class are encouraged to contact their Campus Access Services, in confidence, as soon as possible. Their phone number is \_\_\_\_\_.

## **XI. ACADEMIC INTEGRITY**

The instructor supports the College's policies regarding academic integrity and honesty. These include the policies regarding cheating, plagiarism, and fabrication of information. It is **your** responsibility to understanding fully what these policies are. As such, you are encouraged to obtain a copy of the *Student Rights and Responsibilities Handbook* and read these policies carefully and thoroughly.

- A. **Cheating** – Cheating is defined as the improper taking or tendering of any information or material which shall be used to determine academic credit. Taking of information includes, but is not limited to, copying graded homework assignments from another student; working together with another individual(s) on a take-home test or homework when not specifically permitted by the instructor; looking or attempting to look at another student's paper during an examination and; looking or attempting to look at text or notes during an examination when not permitted. Tendering of information includes, but is not limited to, giving your work to another student to be used or copied; giving someone answers to exam questions either when the exam is being given or after having taken an exam; giving or selling a term paper or other written materials to another student; sharing information on a graded assignment.
- B. **Plagiarism** – Plagiarism is defined as the attempt to represent the work of another as the product of one's own thought, whether the other's work is published or unpublished, or simply the work of a fellow student. Plagiarism includes, but is not limited to, quoting oral or written materials without citation on an exam, term paper, homework, or other written materials or oral presentations for an academic requirement; submitting a paper which was purchased from a term paper service as your own work; submitting anyone else's paper as your own work.
- C. **Copyright law** – Violation of copyright law is defined as the attempt to represent the work of another as the product of one's own thought, whether the other's work is written or found on the Internet or simply the work of a fellow student, violates the copyright laws. It is not limited to quoting oral or written materials, it includes photographs, clipart and music samples. For an academic requirement; submitting a paper, image, and/or music which was copied from website as your own work; submitting anyone else's paper as your own work is considered a breach of copyright laws unless they fall into the guidelines of the Teach Act <http://www.lib.ncsu.edu/scc/legislative/teachkit/>

All class notes, lecture outlines, class assignments, examinations, and any other course information are copyrighted intellectual materials and may not be copied or distributed in any format or for any purpose without permission from the instructor or the author as the case may be.

## **XII. MAJOR COURSE COMPETENCIES AND STANDARDS**

<b>MAJOR COURSE COMPETENCIES/OBJECTIVES</b>	<b>NSTA STANDARDS</b>	<b>SUBJECT MATTER STANDARDS</b>	<b>STATE COMPETENCIES &amp; SKILLS</b>
Upon successful completion of this course, the student will demonstrating knowledge of...			
1. ...origins of hereditary variations.	C2a3, C2a7, C2b15	6.11, 6.12, 6.19, 6.20	5.5
2. ... relationships among processes of change and the time element in evolutionary processes.	C2a4, C.1.3	6.10, 6.18	9.5
3. ...processes of microevolution, mutation, genetic drift, and natural selection.	C2a4, C2a7, C2b15	6.16, 6.17, 6.18, 6.20	9.2, 9.4
4. ...processes that influence diversity in molecular, anatomical, and behavioral characteristics of different organisms.	C2a4, C2a7, C2a9, C2b15	6.3, 6.7, 6.12	3.1, 9.4, 9.8
5. ...the relationship between population genetics and evolution.	C2a6	6.17, 6.19, 12.1-12.3	9.4, 9.8
6. ...the concept of specialization and of the factors that may contribute to the development of new species.	C2a3, C2a4, C2a7	6.3, 6.7, 6.11, 6.17, 6.19	7.1, 7.2, 9.3, 9.4
7. ...of macroevolution and of the major environmental factors affecting it.	C2a4	6.8, 6.9	9.2, 9.4
8. ...the theories of the origin and development of early life.	C2a4, C2a7	6.9, 6.10, 6.20	9.1, 9.6
9. ...hominid evolution.	C2a4, C2a7	6.13, 6.18	9.6
10. ...evolutionary thinking and the evidence for evolution.	C2a4, C2a7, C2b16, C2b18, C.1.4	2.7, 6.13, 6.14, 6.15, 6.18, 6.19	1.1, 1.2, 1.5, 1.8, 9.1,9.7
11. ...nature and applications of scientific processes, limitations and the inquiry-based nature of science.	C2c25, C.1.3	1.3, 2.1, 2.2, 2.3, 2.4, 2.6, 4.1, 4.2, 4.4, 12.1-12.3	1.3, 1.5, 1.6, 1.7, 1.8



### **XIII. SAMPLE COURSE CALENDAR**

<b>Week</b>	<b>Topic</b>	<b>Competencies</b>
Week 1	The Scientific Method	○ Competency = 11
Week 2	Systematics and Phylogeny	○ Competency = 1, 3, 4, 6
Week 3	Chemical Evolution	○ Competency = 8
Week 4	The Origin of Life	○ Competency = 8
Week 5	History and Diversity of the Fossil Record	○ Competency = 4, 8, 9
Week 6	Biological Adaptation	○ Competency = 4, 7
Week 7	Development of Darwin's Theory of Natural Selection	○ Competency = 10
Week 8	Natural Selection	○ Competency = 3, 4, 10
Week 9	Biological Evolution	○ Competency = 3, 6, 7
Week 10	Population Genetics	○ Competency = 5
Week 11	Microevolution	○ Competency = 3
Week 12	Speciation	○ Competency = 6
Week 13	Macroevolution	○ Competency = 7
Week 14	Biogeography	○ Competency = 2, 3, 4, 6
Week 15	Hominid Evolution	○ Competency = 9
Week 16	The Evolution Debate	○ Competency = 11