COURSE APPROVAL DOCUMENT
Southeast Missouri State University

Department: Biology Course No. BI 163

Title of Course: Evolution and Ecology Date: Fall 2016

Please check: X New
☐ Revision

I. Catalog Description (Credit Hours of Course):

An introduction to principles of evolution and ecology of organisms through application of the scientific method. Three lectures and one two-hour lab. (4)

II. Prerequisites: CH 185; MA 134 or MA 137 or MA 139 or MA 140; EN 100 qualified.

III. Purposes or Objectives of the Course (optional):

Students will:

Evolution

A. Formulate and test scientific hypotheses.
B. Explain the unity and diversity of life.
C. Explain evolution by natural selection and by genetic drift.
D. Calculate strength of selection and heritability. Use the results to diagram how quickly a population might evolve.
E. Describe evidence for transitional forms in the fossil record. Describe how radiometric dating is used to calculate the age of fossils.
F. Evaluate and revise evolutionary hypotheses using anatomical, fossil, and genetic evidence.
G. Describe how new species evolve by allopatric isolation.

Ecology

H. Describe and differentiate basic experimental and observational approaches to ecology.
I. Calculate basic descriptive statistics with ecological data.
J. Identify and summarize the hierarchical levels of ecological systems (population, community, ecosystem, biosphere).
K. Evaluate what factors can influence population distribution and growth (e.g., births, deaths, immigration, emigration).
L. Explain what species interactions are and how they affect community dynamics.
M. Explain the movement of energy and cycling of certain elements and molecules (e.g., carbon, water) through ecosystems.
N. Describe the greenhouse effect and why it is important.

IV. Student Learning Outcomes (Minimum of 3):

A. Students will be able to apply the scientific method by developing a hypothesis, locating and gathering the information to test the hypothesis, and then communicating the results.
B. Students will be able to interpret evidence for relatedness among organisms, evaluate hypotheses using that evidence, and communicate the results.
C. Students will be able to apply statistical techniques to test ecological hypotheses, and interpret and communicate the results.

V. Optional departmental/college requirements:

A.

VI. Course Content or Outline (Indicate number of class hours per unit or section):
Topic (Hours for Lecture/Lab)

Lecture Schedule

Topic	Lecture Periods
Biodiversity and taxonomy.	1
Science and the scientific method.	2
Hypotheses and hypothesis testing.	2
Phylogenetic trees as evolutionary hypotheses.	2
What is evolution?	2
Evolution in populations: genetic drift.	2
Evolution in populations: natural selection.	3
How do new species evolve? Allopatric speciation.	2
Fossils and dating	2
Transitional forms (whales, birds)	2
Evolutionary developmental biology	2
Hierarchical Organization in Ecology	2
Experimental and Sampling Approaches for Ecology	2
Understanding Variation and Basic Statistical Analyses	2
Water Cycle; Adaptation to Aquatic Environments	2
Photosynthesis & Thermal Ecology	3
Energy Movement, Carbon Cycle, and the Greenhouse Effect	3
What is a Biome?	1
What Influences Population Distribution and Growth?	2
Population and Community Dynamics	3
Exams (3) plus final	3
Total	45

Lab Schedule:

Exercises	Week
How do you know what you know? (in lab)	1
Taxonomy and Biodiversity (take-home)	
Scientific Method – Digestion (in-class), Mutation (take home?)	2
Hypothesis testing- Jack Noire	
Constructing phylogenetic trees. Parsimony.	3
First Hypothesis.	
Homology and analogy.	4
Homology: anatomical evidence	
Homology: skeletal evidence.	5
Homology: Embryos.	
Revised hypothesis.	
Chips are down: natural selection and genetic drift.	6
Transitional forms: reptile-mammal, hominids	7
Revised hypothesis.	
Genetic evidence.	8
Final hypothesis.	
Introduction to hypothesis testing with statistics: in class handouts	9
Experimental and sampling design: handout and exercise	10
Communicating with ecological data: creating tables & figures	11
Communicating with ecological data: primary literature discussion	12
Getting access to ecological data: library skills activity & handout	13
Synthesizing the scientific process	14
Presenting hypotheses and your ecological data	15

Please Attach copy of class syllabus and schedule as an example

Signature: _____ Date: _____
Chair

Signature: _____ Date: _____
Dean

BI 163: Evolution and Ecology: Fall 2016

An introduction to principles of evolution and ecology of organisms through application of the scientific method. Three lectures and one two-hour lab. (4 credit hours)

Instructor: Dr. Michael Taylor
Office: 217 Rhodes Hall
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webpage: http://learning.semo.edu
Office hours: T R F 10–11 am or by appointment

Teaching Assistants:
Harriet Nelson
Office MG134
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Office Hours: M, W, F 1-2 or by appointment

Class Meeting Times

Lecture: M W F 1:30–2:20 in RH121
Labs in MG 101:
Section 1: M 10:00–11:50
Section 2: M 2:30-4:20
Section 3: T: 9:00–10:50
Section 4: T: 11:00–12:50
Section 5: T: 3:00–4:50
Section 6: R: 8:00–9:50
Section 7: R: 10:00–11:50
Section 8: R: 12:30-2:20

Learning Objectives

Students will:

Evolution

O. Formulate and test scientific hypotheses.
P. Explain the unity and diversity of life.
Q. Explain evolution by natural selection and by genetic drift.
R. Calculate strength of selection and heritability. Use the results to diagram how quickly a population might evolve.
S. Describe evidence for transitional forms in the fossil record. Describe how radiometric dating is used to calculate the age of fossils.
T. Evaluate and revise evolutionary hypotheses using anatomical, fossil, and genetic evidence.
U. Describe how new species evolve by allopatric isolation.

Ecology

V. Describe and differentiate basic experimental and observational approaches to ecology.
W. Calculate basic descriptive statistics with ecological data.
X. Identify and summarize the hierarchical levels of ecological systems (population, community, ecosystem, biosphere).
Y. Evaluate what factors can influence population distribution and growth (e.g., births, deaths, immigration, emigration).
Z. Explain what species interactions are and how they affect community dynamics.
AA. Explain the movement of energy and cycling of certain elements and molecules (e.g., carbon, water) through ecosystems.
BB. Describe the greenhouse effect and why it is important.

Student Learning Objectives

D. Students will be able to apply the scientific method by developing a hypothesis, locating and gathering the information to test the hypothesis, and then communicating the results.
E. Students will be able to interpret evidence for relatedness among organisms, evaluate hypotheses using that evidence, and communicate the results.
F. Students will be able to apply statistical techniques to test ecological hypotheses, and interpret and communicate the results.

Book

Reece, J.B., L.A. Urry, M.L. Cain S.A. Wasserman, P.V. Minorsky and R.B. Jackson. 2014. *Campbell Biology*, 10th ed. Benjamin-Cummings.

Grading

You will be graded in the following ways:

Assessment	Percentage
Examinations	40%
Laboratory Assignments	40%
Other Assignments	20%

Three examinations and the final examination will consist of some combination of multiple choice, true/false, matching, and short or long answer questions. Laboratory assignments will consist of a combination of in-laboratory exploration/analysis and at-home writing assignments. Other assignments may include in-lecture, homework, or online Moodle lessons.

If you get the following percentages, you will be guaranteed the following grades. However, I may lower the cutoffs **at the end of the semester.**

90-100%: A
80-89%: B
70-79%: C
60-69%: D
0-59%: F

Detailed information on the exams and assignments can be found in the on-line syllabus

Class Policies

Attendance and Absences

You are expected to attend every class period. If you have an excusable absence I will ask for some form of evidence. If you miss a class without an excused absence you will not be able to make up the missed work.

Excusable absences will be dealt with on a case by case basis. I reserve the right to ask you to provide evidence for your absence. If you obtain a doctor's note, I only need to know that you were unable to come to class due to medical reasons. I do not need to know the specific reason (i.e. the medical condition). If possible, please contact me ahead of time if you plan to miss class with an excusable absence. Note: scheduling an advising appointment during class is not an excusable absence.

Lab Rules and Regulations

You will be in a laboratory for part of this course. You will be expected to abide by the following rules. If you fail to do so you will be asked to correct the issue or, if necessary, asked to leave the lab.
1) No food or drink is allowed in the laboratory. If you need to drink or eat, please step outside the lab when time allows. This includes chewing gum.
2) All students must wear long pants and may not wear open toed shoes.
3) When working with chemicals in the lab students must wear gloves.
4) Students must clean up after themselves before leaving the class.

Handouts

All handouts (including assignments and quizzes) and papers are given to you for your own personal use for this course. They are not to be distributed to any third party or posted on-line on any additional website. Classes may not be recorded without the permission of the instructor. If permission is granted, it is done so for your own personal use. No recordings of this course should be posted on any website or distributed to a third party.

Cell Phones

Cell phones must be turned off (meaning no power) during class. I reserve the right to ask anyone text messaging or calling on a phone to leave the class. If this occurs, the student will receive a zero for that day's work. If you must have the phone on, please discuss your reason with me before class; if I accept your reason, please keep it on vibrate.

University Policies

Academic Policy Statement

Students will be expected to abide by the University Policy for Academic Honesty regarding plagiarism and academic honesty. Refer to: http://www6.semo.edu/judaffairs/code.html
Any act of plagiarism will result in a zero for that assignment for all people involved.

Questions, comments and concerns about the course

Questions, comments or requests regarding this course or program should be taken to your instructor. Unanswered questions or unresolved issues involving this class may be taken to Dr. James Champine (Chair of Biology).

Student with Disabilities Statement

If a student has a special need addressed by the Americans with Disabilities Act (ADA) and requires materials in an alternative format, please notify the instructor at the beginning of the course. Reasonable efforts will be made to accommodate special needs.

Civility Statement

"Every student at Southeast is obligated at all times to assume responsibility for his/her actions, to respect constituted authority, to be truthful, and to respect the rights of others as well as to respect private and public property. In their academic activities, students are expected to maintain high standards of honesty and integrity and abide by the University's Policy on Academic Honesty. Alleged violations of the Code of Student Conduct are adjudicated in accordance with the established procedures of the judicial system." (From the preamble of the Statement of Student Rights and Code of Student Conduct, revised January 8, 2004, Southeast Missouri State University)

Schedule of topics:

Week 1
Lecture Topics:
Course Introduction
Biodiversity and taxonomy
Science and the scientific method

Lab:
How do you know what you know? (in lab)
Taxonomy and Biodiversity (take-home)

Week 2
Lecture Topics:
Hypotheses and hypothesis testing
Phylogenetic trees as evolutionary hypotheses

Lab:
Scientific Method—Digestion (in-class), Mutation (take home)
Hypothesis testing- Jack Noire

Week 3
Lecture Topics:
Phylogenetic trees as evolutionary hypotheses
What is evolution?

Lab:
Constructing phylogenetic trees. Parsimony.
First Hypothesis.

Week 4
Lecture Topic:
Evolution in populations: genetic drift.
Exam 1.

Lab:
Homology and analogy.
Homology: anatomical evidence

Week 5
Lecture Topic:
Evolution in populations: natural selection.

Lab:
Homology: skeletal evidence.
Homology: Embryos.
Revised hypothesis.

Week 6
Lecture Topic:
How do new species evolve? Allopatric speciation.
Fossils and dating

Lab:
Chips are down: natural selection and genetic drift.

Week 7
Lecture Topic:

Fossils and dating
Transitional forms (whales, birds)

Lab:
Transitional forms: reptile-mammal, hominids
Revised hypothesis.

Week 8
Lecture Topic:
Evolutionary developmental biology
Exam 2.

Lab:
Genetic evidence.
Final hypothesis.

Week 9
Lecture Topics:
Hierarchical Organization in Ecology
Experimental and Sampling Approaches for Ecology

Lab:
Introduction to hypothesis testing with statistics: in class handouts

Week 10
Lecture Topics:
Experimental and Sampling Approaches for Ecology
Understanding Variation and Basic Statistical Analyses

Lab:
Experimental and sampling design: handout and exercise

Week 11
Lecture Topics:
Water Cycle; Adaptation to Aquatic Environments
Photosynthesis & Thermal Ecology

Lab:
Communicating with ecological data: creating tables & figures

Week 12
Lecture Topic:
Photosynthesis & Thermal Ecology
Exam 3.

Lab:
Communicating with ecological data: primary literature discussion

Week 13
Lecture Topics:
Energy Movement, Carbon Cycle, and the Greenhouse Effect

Lab:
Getting access to ecological data: library skills activity & handout

Week 14
Lecture Topics:
What is a Biome?

What Influences Population Distribution and Growth?

Lab:
Synthesizing the scientific process

Week 15
Lecture Topics:
Population and Community Dynamics

Lab:
Presenting hypotheses and your ecological data

Final
Wednesday 12pm in MG 101.