Course Outline

Course Number: BIO 204
Course Title: Ecology

Credits: 4
Hours: Lecture 3 / Laboratory 3

Prerequisite: General Biology I (BIO 101) with a minimum of a "C" Final Grade.

Corequisite: General Biology II (BIO 102)

Catalog Description: Fundamental concepts, theoretical principles, and practical applications of modern ecology: the study of the interactions of organisms with each other and their environment. Laboratory classes of this introductory course involve field work and research projects geared towards ecological application.

Required texts/other materials:

Thomas M. Smith and Robert Leo Smith
Pearson

Course coordinator:

Ronald M. Smith, PhD
Telephone: (609)-570-3395
Office: MS 108
E-mail: smithro@mccc.edu

Syllabus Revision date: Fall 2016
Course competencies/goals:
The students will be able to:

1. Discuss ecological applications and understand how ecology is the study of relationships between organisms and their environment.

2. Examine the diversity of life and explain the biological processes that link them together.

3. Apply concepts of biological evolution to all course topics.

4. Examine plant diversity and explain the process of photosynthesis, nutrient uptake, reproduction, and adaptation to the environment.

5. Examine animal diversity and explain how structure and function regulate bioenergetic, physiological, behavioral processes, and adaptation to the environment.

6. Explore ecological principals that link individuals at populations, community, landscape, and ecosystem levels.

7. Investigate the effects humans are having on disrupting natural ecosystem function.

General education knowledge goals:
Goal 1. Communication. Students will communicate effectively in speech and writing.
Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.
Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.
Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.
Goal 8. Diversity. Students will understand the importance of a global perspective and culturally diverse peoples.

MCCC core skills:
Goal A. Written and Oral Communication in English. Students will communicate effectively in speech and writing, and demonstrate proficiency in reading.
Goal B. Critical Thinking and Problem-solving. Students will use critical thinking and problem solving skills in analyzing information.
Goal C. Ethical Decision-Making. Students will recognize, analyze and assess ethical issues and situations.
Goal D. Information Literacy. Students will recognize when information is needed and
have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Goal E. Computer Literacy. Students will use computers to access, analyze or present information, solve problems, and communicate with others.

Goal F. Collaboration and Cooperation. Students will develop the interpersonal skills required for effective performance in group situations.

Goal G. Intra-Cultural and Inter-Cultural Responsibility. Students will demonstrate an awareness of the responsibilities of intelligent citizenship in a diverse and pluralistic society, and will demonstrate cultural, global, and environmental awareness.

Units of study in detail:

Unit 1: The Nature of Ecology

Learning Objectives:
The student will be able to…

1. Develop an understanding of ecology and how it is the study of relationships between organisms and their environment. (Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 3, 4, 8, 9; Core A, B, D, E, F)

2. Identify how ecological systems form a hierarchy. (Course Goal 1, 3, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)

3. Investigate nature using the scientific method. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4, 9; Core A, B, C, D, E, F, G)

4. Evaluate the ties between ecology and other disciplines. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)

Unit 2: Climate

Learning Objectives:
The student will be able to…

1. Develop and understanding of seasonal variation with solar radiation and how the earth intercepts solar radiation. (Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)

2. Determine why air temperature decreases with altitude and how temperature influences moisture content of air. (Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)

3. Discuss earth’s rotation on wind and ocean currents. (Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)
4. Discuss global patterns of air circulation, ocean currents, and precipitation.  
   *(Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)*
5. Evaluate the influence of topography and microclimates on organism distribution.  
   *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)*

**Unit 3:** The Aquatic Environment

**Learning Objectives:**

The student will be able to…

1. Understand how the hydrologic cycle links all marine and freshwater aquatic ecosystems. *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4, 8, 9; Core A, B, C, D, E, G)*
2. Identify water’s distinctive properties and how this result from its structure. *(Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)*
3. Determine why light, temperature, and oxygen levels all generally decrease with water depth. *(Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)*

**Unit 4:** The Terrestrial Environments

**Learning Objectives:**

The student will be able to…

1. Discuss major constraints imposed on organisms by the transition from water to land. *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)*
2. Determine how plants are the dominant factor determining the vertical gradient of light. *(Course Goal 1, 2, 3, 4, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)*
3. Understand soil’s importance, weathering, and its formation. *(Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 3, 4, 8, 9; Core A, B, C, D, E, G)*
4. Identify the distinguishing physical properties of soil. *(Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)*
5. Evaluate a profile, water-holding, and ion exchange capacities of soil types. *(Course Goal 1, 2, 3, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)*

*Test 1: Covers units 1 – 4.*

**Unit 6:** Plant Adaptations to the Environment

**Learning Objectives:**

The student will be able to…
1. Discuss photosynthesis along with its importance, stages, and alternative pathways. (Course Goal 1, 2, 3, 4, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)
2. Evaluate net photosynthesis, respiration, light, CO₂ uptake, and water movement by plants. (Course Goal 1, 2, 3, 4, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)
3. Evaluate plant adaptations to variations in light, precipitation, temperature, nutrients, and wetland environments. (Course Goal 1, 2, 3, 4, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)

Unit 7: Animal Adaptations to the Environment

Learning Objectives:
The student will be able to…
1. Describe why animals require essential amino acids, minerals, O₂, and homeostatic conditions. (Course Goal 1, 2, 3, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)
2. Evaluate animal adaptations to acquiring and digesting food. (Course Goal 1, 2, 3, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)
3. Discuss animal adaptations to maintain internal body temperature. (Course Goal 1, 2, 3, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)
4. Discuss animal adaptations to maintain water balance. (Course Goal 1, 2, 3, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)
5. Identify animal adaptations to daily and seasonal photoperiods. (Course Goal 1, 2, 3, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)

Unit 10: Life History

Learning Objectives:
The student will be able to…
1. Compare asexual and sexual reproduction and forms of sexual reproduction. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)
2. Describe types of animal mating systems and sexual selection of females. (Course Goal 1, 2, 3, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)
3. Discuss how reproductive effort varies in timing, parental care, fecundity, latitude, and with habitat selection. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)
*Test 2: Covers units 6, 7, and 10.*

**Unit 8: Properties of Populations**

**Learning Objectives:**

The student will be able to…

1. Discuss the importance and identify population properties, such as geographic range, density, spatial distribution, and dispersal. *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)*

2. Demonstrate techniques for counting and sampling population sizes and densities. *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)*

3. Describe the importance of a populations age structures and sex ratio. *(Course Goal 1, 2, 3, 5, 6, 7; Gen Ed 1, 2, 3, 4, 8, 9; Core A, B C, D, E, G)*

**Unit 13: Interspecific Competition**

**Learning Objectives:**

The student will be able to…

1. Discuss how interspecific competition involves multiple species vying for the same limited resource. *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)*

2. Analyze how the outcome of interspecific competition is affected by a variety of factors. *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4, 8, 9; Core A, B, C, D, E, G)*

3. Identify how interspecific competition influences a species niche and natural selection. *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4, 8, 9; Core A, B, C, D, E, G)*

**Unit 14: Predation**

**Learning Objectives:**

The student will be able to…

1. Understand that predation is the consumption of all or part on one living organism by another. *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)*

2. Evaluate how foraging involves decisions about the allocation of time and energy. *(Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)*

3. Identify the various predator defenses that are exhibited by different prey species. *(Course Goal 1, 2, 3, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)*
4. Describe how predators have evolved different hunting methods to overcome predator defenses. (Course Goal 1, 2, 3, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)

5. Identify plant adaptations to avoid or deter predation by herbivores. (Course Goal 1, 2, 3, 4, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)

*Test 3: Covers units 8, 13 and 14.*

**Unit 15: Parasitism and Mutualism**

**Learning Objectives:**

The student will be able to…

1. Discuss how parasites exploit their hosts for food, habitat, and dispersal. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4, 8, 9; Core A, B, C, D, E, G)

2. Understand the main types and adaptations of hosts to minimize impacts of parasites. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)

3. Identify characteristics of mutualism and discuss this as a type of symbiosis beneficial to both species. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)

4. Investigate the differences and similarities between symbiotic and nonsymbiotic mutualisms. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 3, 4; Core A, B, D, E)

**Unit 16: Community Structure**

**Learning Objectives:**

The student will be able to…

1. Investigate the richness, relative abundance, and types of species in a community. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)

2. Discuss food chains, food webs, and trophic levels in a community. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)

3. Determine physical structure and zonation in a community. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)

**Unit 18: Community Dynamics**

**Learning Objectives:**

The student will be able to…

1. Evaluate the process of primary and secondary ecological succession. (Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E)
2. Discuss autogenic and allogenic changes in environmental conditions. (*Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4; Core A, B, D, E*)

3. Determine patterns of species diversity and succession. (*Course Goal 1, 2, 3, 4, 5, 6, 7; Gen Ed 1, 2, 3, 4, 8, 9; Core A, B, C, D, E, G*)

*Test 4: Covers units 15, 16, and 18.*

**Philosophy of the course:**
BIO 204 is intended to provide you with an exposure to a broad realm of fundamental concepts in the science of ecology. This course will assist you in attaining an understanding of ecological principles, and it will help you to develop essential skills in the discipline. The lecture presentations and discussions, field and laboratory research, textbook reading assignments, and major tests will provide you with an integrated selection of learning activities which can lead you to success. You are ultimately responsible for your own level of learning. It is you who will decide and determine how much time and effort will be devoted to this course and how much you will learn from it.

**Classroom conduct:**
The college welcomes students into an environment that creates a sense of community, pride, and respect.

**Attendance**
It is a student’s responsibility to attend all classes. If a class meeting is missed, the student is responsible for content covered, announcements made in his/her absence, and for acquiring materials distributed in class. Because the Laboratory Field component is so critical towards satisfying the educational requirements of BIO 204, any student missing more than one scheduled laboratory / field exercises will receive an “F” (Failure) Final Grade for the semester unless the student has already officially withdrawn from the course. There are No Exceptions to this Policy. Missed laboratory / field exercises cannot be made up, therefore, any potential concerns should be discussed in advance with me before they can become an issue.

**Tardiness**
It is expected that students will be on time for all classes. Students must be on time for all exams. Students late for an exam will be denied the opportunity to take the exam. A student who enters the laboratory late may not be able to participate in the lab.

**Behavior**
Students are expected to follow ordinary rules of courtesy during class sessions. The instructor has the right to eject a disruptive student from the class at any time. *Phones and other devices are to be turned off prior to the start of and not used during class time. This includes texting.* Leaving class and then returning while the class is in session is not acceptable behavior. Children are not permitted in the classroom without prior approval of the instructor.
**Evaluation of student learning:**
All exams covering lecture and textbook content are given in class. Students must take the exams when they are normally scheduled. It is the students’ responsibility to be present to take and complete all exams. Absence constitutes a zero score on any missed exam. Each exam can be taken one time only and there normally will be no make-ups. In the case of an emergency, the student must contact the instructor within 24 hours. Examination questions may be objective (multiple choice, T-F, matching, or fill-in the-blank) and/or short answer essay. **You are expected to arrive on time in order to take the test.**

**Grading Procedure**
Grades are based on the total accumulation of earned points. All exams covering the lecture and textbook material, homework, in-class graded activities, all laboratory quizzes, lab reports and lab practicals contribute to the total number of possible points.

<table>
<thead>
<tr>
<th>% of Total Points Earned</th>
<th>Final Course Grade</th>
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<tbody>
<tr>
<td>93 – 100</td>
<td>A</td>
</tr>
<tr>
<td>90 – 92</td>
<td>A-</td>
</tr>
<tr>
<td>87 – 89</td>
<td>B+</td>
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<td>60 – 69</td>
<td>D</td>
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<tr>
<td>0 – 59</td>
<td>F</td>
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**Accommodations**
Mercer County Community College is committed to ensuring the full participation of all students in its programs. If you have a documented differing ability or think that you may have a differing ability that is protected under the ADA and Section 504 of the Rehabilitation Act, please contact Arlene Stinson in LB 216 stinsona@mccc.edu for information regarding support services. Anyone with accommodations must notify me one full week before testing in the college testing center for each exam. If you do not have a documented differing ability, remember that other student resources are available to all students on campus including academic support through our Learning Center located in LB 214.

**Academic Integrity Statement:**
Any student who (a) knowingly represents the work of others as his/her own; (b) uses or obtains unauthorized assistance in the execution of any academic work; or (c) gives fraudulent assistance to another student is guilty of cheating. Violators will be penalized in accordance with established college regulations, policies, and procedures. **All violations of academic integrity will be reported to the Academic Integrity Committee.** Refer to the Student Handbook for additional information.
Tentative schedule of laboratory and field exercises:

<table>
<thead>
<tr>
<th>Dates: 2016</th>
<th>Field Exercises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fri. 9/2</td>
<td>Stream macroinvertebrate monitoring</td>
</tr>
<tr>
<td>Sat. 9/17</td>
<td>Vegetative change along a hydro-sequence (Introduction)</td>
</tr>
<tr>
<td>Fri. 9/16</td>
<td>Stream macroinvertebrate monitoring (Results)</td>
</tr>
<tr>
<td>Fri. 9/23</td>
<td>Forest succession assessment</td>
</tr>
<tr>
<td>Fri. 9/30</td>
<td>Forest succession assessment (Methods)</td>
</tr>
<tr>
<td>Fri. 10/14</td>
<td>Small mammal community</td>
</tr>
<tr>
<td>Fri. 10/21</td>
<td>Small mammal community (Discussion)</td>
</tr>
<tr>
<td>Fri. 11/11</td>
<td>Effects of pollution on algae growth</td>
</tr>
<tr>
<td>Fri. 11/18</td>
<td>Effects of pollution on algae growth (Full Lab Report)</td>
</tr>
</tbody>
</table>

General guidelines concerning the field experiments:

Transportation:
Transportation to all off campus sites will be via a college van when possible. We will plan to arrive at our destination as a group. We may need someone to volunteer to drive their own motor vehicle to help transport a few members of the class if the van is unable to accommodate everyone.

Punctuality:
The college van will leave from the side of the College’s Security Office promptly at scheduled departure time, so please be on time and ready to go. Also no one is to be left behind at any of the study sites.

Attire:
Dress appropriately. Please consider both the nature of the study site to be visited and the predicted weather conditions.

Participants:
Only students who are officially enrolled and registered for the ecology course can come on the trips. This means brothers, sisters, mothers, fathers, grandparents, cousins, friends, and significant others cannot join us.
Behavior:
We are guests at all off campus sites. Inappropriate behavior and language will not be tolerated. We represent the college. Yes, we want to enjoy ourselves, but we also want to be welcomed back in the future.

Notebooks:
You are responsible for learning during the trips. Therefore, please bring a notebook and a writing instrument and use them. Cameras and tape-recorders are permitted.

Expectations:
You are expected to be friendly, polite to each other, ask thoughtful and relevant questions when appropriate, and most of all learn from and enjoy the experience.

**Determining your grade:**

**Lecture**
First Major Test: Maximum of 100 points available – earned points = ______ 
Second Major Test: Maximum of 100 points available – earned points = ______
Third Major Test: Maximum of 100 points available – earned points = ______
Fourth Major Test: Maximum of 100 points available – earned points = ______

Homework Assignments / Questions: Maximum 100 points – earned points = ________
Class Room / Discussion Participation: Maximum 50 points – earned points = ________

**Total Earned Lecture Points (550 total possible lecture points) = ______**

**Field / Laboratory Assignments**
Introduction Writing Assignment: Maximum of 25 points available – earned points = ______
Methods Writing Assignment: Maximum of 25 points available – earned points = ______
Results Writing Assignment: Maximum of 25 points available – earned points = ______
Discussion Writing Assignment: Maximum of 25 points available – earned points = ______
Field Report: Maximum of 100 points available – earned points = ______
Presentation on pesticide – herbicide: Maximum 50 points – earned points = ______
Field / Lab Participation: Maximum of 50 points available – earned points = ______

**Total Earned Lab Points (300 total possible lab points) = ______**

**Total Earned Points in the Course = ______, divided by the 8.5 =**

**GRADE OR FINAL GRADE IN BIO 204 = ______.**

Lastly, I reserve the right to modify and alter this course syllabus at any time during the semester as may be professionally necessary and appropriate.