FIELD ECOLOGY-BIO 258

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Required: There is a digital version of this textbook: ISBN-13: 978-0-13-464965-8

Text: **<u>Environment : The Science Behind the Stories</u>; 6th edition (subscription)**. Withgott & Laposata; ISBN-13: 978-0-13-464965-8

Other Materials: Handouts and online

Lab Manual: Portfolio and Handouts.

Calculator: helpful in lab. Cell phones and other electronic devices may be used during field work.

Course Description:

This course is designed to provide hands-on field research experiences in ecology and environmental science. Students will be introduced to quantitative field science methodology, natural history, current research issues, and will participate in data collection for ongoing research projects. The ecological concepts that underlie modern hypothesis tests in ecology will be explored through discussions, readings and field research activities. Conducting regionally-based ecological projects with ecological mathematical methods are a major component of this course. People highly allergic to poison ivy, insects, molds or pollen need to take precautionary steps during field studies.

Prerequisite: ENG 085*, ENG 090* and MTH 031* or higher

Students will develop a scientific skill-set to understand the four strands of scientific investigation, content, process, communication, and the nature of science. Students will use the critical thinking to evaluate scientific information, data, and current field ecological investigations. The foundation for field ecology will be constructed using the four strands. The fundamental concepts in field ecology, like ecological cycles, evolution, analytical chemistry, molecular biology, genetics, and biotechnology, are presented in context with current field studies. The students will compare and contrast the content and process through communications with their peers and the instructor ultimately understanding the nature of science. The four strands will improve the student's scientific literacy which will support the enduring understanding of the building blocks of field ecology and biology. This course is designed for people interested in field ecology using their computational skills, and includes a strong active learning component and field work.

Upon completing this course students will retain a skill-set derived from critical thinking and ecological scientific methodology. This skill-set can be used in classes following field ecology, and in problem solving needs through-out their lives. Although this course is an introductory class, introductory does not translate into easy. This course does not require background knowledge in field ecology. It will require effort to build the scientific foundation and the philosophical underpinnings of critical thinking and scientific thought. Students will have to spend time studying the material to succeed. For this course, you should expect to be in the field 8 hours a week, and depending on your specific field study, this time commitment may increase or decrease. You are responsible for the resulting grade that you shall receive.

Course Objectives:

Upon completing this course I will be able to:

- Understand how the nature of science is a result of the content, process, and communication; and, how this process is self-correcting.
- Identify the big ideas in scientific discourse including how levels of ecological hierarchy pertain to biotic and abiotic properties.
- Integrate information of natural processes that govern the natural world into laboratory and field practice.
- Critically evaluate data drawn from natural phenomena to establish a scientific baseline.
- Understand the connection between population growth patterns, ecological function, and abiotic-biotic interaction.
- Measure ecological variables and interpret results of scientific field studies of ecological hypotheses.
- Understand how the mechanisms of evolutionary change, natural selection, mutation, migration, genetic drift, and sexual selection affect populations.
- Understand the concept of sustainability as it relates to ecology.

General Education Outcomes:

All JC graduates should develop or enhance certain essential skills while enrolled in college, as defined by the Board of Trustees. The General Education Outcomes addressed in this class are:

GEO 4: Demonstrate scientific reasoning

Incompletes - Consistent with JC policy, incompletes are granted with instructor permission only in situations where a student is passing the course and encounters an unusual emergency that prevents them from completing coursework.

Instructor Absence/School Closing: If I am unable to attend class, the building secretary will be notified, and a notice will be posted outside our room. If the college is closed due to inclement weather, announcements are made on local radio stations. With the exception of these two situations, **ASSUME WE WILL HAVE CLASS.**

Plagiarism and Cheating - Be sure that homework and any assignments are your own work. Copying anyone else's work is **plagiarism,** and plagiarized work will **not be accepted**. Evidence of plagiarism or cheating on any exam, lab, lab quiz or assignment will result in a "0" score for that assignment and notification of the Academic Dean

Extra Credit - is not given in the course. Focus your time and energy on completing course assignments and studying for lab quizzes and lecture exams.

Course Help and Special Needs - if you have special needs that I should be aware of in order to help you to best learn course material, please let me know as soon as possible. Students requiring special assistance (including those affected by the Americans with Disabilities Act) should contact the Center for Student Success in Bert Walker Hall, Room 123, 796-8415. Tutoring services are free at JC - if at any point in the course you feel that you would benefit from a tutor, contact me and/or the CSS.

Computer Resources – reliable computer access is necessary for this course, as some course materials can be accessed only through the course webpage. I will post announcements and grades, as well as many other course materials like discussion papers through this system. Simply type in the URL http://personal.jccmi.edu/albeescsteven. Subject to construction.

Grading Scale - Grades will be rounded to the nearest percent. Grades may be curved at the instructor's discretion.

Percent	Grade	Percent	Grade	Percent	Grade
90 - 100%	4.0	75 – 79 %	2.5	60 – 64 %	1.0
85 – 89 %	3.5	70 – 74 %	2.0	55 – 59 %	0.5
80 – 84 %	3.0	65 – 69 %	1.5		

Student Responsibilities:

Attendance - I expect that you will do your best to attend every class. Because testing is primarily from lectures, and discussion papers are only accepted from those completing a discussion in person, missing class makes it very hard to do well.

Keep Up With Homework - If you miss class, it is your responsibility to find out if homework is due on the day you return. In class assignments cannot be made up.

Contribute to a courteous learning environment – Our class time is valuable. Please be punctual, especially on exam days, to avoid disruption to others and to be aware of class announcements. Anyone who interferes with the learning of others will be asked to leave class. This includes talking while I am talking, using cell phones or other devices during class, or being disruptive or disrespectful to others.

Study - This is a difficult course that will take significant study time outside of class. You will need to use the text and electronic resources, review notes and do study questions to prep for exams and lab quizzes.

Grading:
Lecture and Field exams account for 60% of the overall grade, and the portfolio representing your scientific investigations will be 40% of your grade. The grading schematic is described here. To determine your overall course grade at any point, ask your instructor:

Exams – There will be approximately seven exams in the course, which may include multiple choice, fill-in, short answer, problem solving, and essay. A missed exam will be given with the appropriate excuse or the instructor's discretion.

Homework assignments - will be accepted up to one class day late, but with a 10% point reduction of possible points after the first five minutes of class time the day they are due. Unless otherwise directed, all assignments should be typed, and will not be accepted otherwise. In class assignments cannot be made up due to the laboratory nature of the class. Deadlines are not negotiable, and technology failure is not an excuse for late work. Protect your work carefully, including saving early and often, backing up work in more than one place, etc.

Portfolio – The Environmental Science Portfolio

The traditional view of science and science education is the dissemination of information from a traditional educational setting wherein the students have no ownership for the work that they perform and are not asked to reflect on the work that they are asked to do. This introduction to science is an unscientific process that is 99% preparation and 1% application. The scientific tests run by the class are usually critical of the scientific process and the nature of science and novel hypothesis testing is pushed to more advanced classes. The environmental science portfolio is designed with the idea of implementing authentic scientific research in the introductory classes. Portfolio development is based upon the acquisition of skills by the students evidenced by the material in their portfolio. Due to the philosophical nature of environmental science, the portfolio allows the student time to reflect on the work that they are doing in class. Reflection increases the likelihood that class time will be meaningful to the students and be integrated into their own scientific world view. Time will be set aside for students to reflect on, process, and integrate the information into their construction of reality.

The portfolio is a meaningful assessment that the student can take with them as evidence of their learning. The portfolio will challenge the students to present what they know as a reflection of personal growth and development as a professional scientist; and the portfolio is evidence of the student's professionalism and their capacities in science when applying for a position at a university or with an employer.

The portfolio is expected to teach people how to express that they have:

- Reflected upon the class
- Reflected on their own skill-set and development
- Done literature research and accessed information for performing their functions as scientists
- Integrated the knowledge to future assessment and hypothesis testing

As described, the portfolio will be similar to a scientific lab book that contains summaries of hypothesis tests and processing of the refutation or failure of the refutation of the tested hypothesis.

The students should record their reflections on the critical discussions and critical evaluations of issues discussed in the environmental science class and hypothesis testing. The students should record their reflections and critical analysis of scientific papers and readings from class. The students should actively record their reflections on their own reviews of books and articles that they come across during class. The reflections should show evidence of independent research and the results from that research. The portfolio should contain reflections from those of their peers and discussions that they have from people participating in their education. The portfolio should contain reflections on their field experiences and observations that they make while they are in the field testing ecological hypotheses. The students should reflect on their performance for each task that they perform as professional environmental scientists and describe the successes and failures from those experiences and ways that the experience may be improved in the future. The students should record any scientific presentations and scientific activities with notes on the observations and reactions of their peers. The portfolio should contain examples of their own scientific research.

The environmental science portfolio is a record of the student's professional development as an environmental scientist. The documentation is progressive with respect to how the scientific process changes for the student over the course of the program. The progressions will be shown within the framework of scientific achievements and the continuing process of testing hypotheses and building upon what was learned from reflected on previous scientific experiences and hypothesis testing. Considering that science is a social exercise, the portfolio will also show evidence of participation and engagement with others as the lab group successfully tests environmental science hypotheses. The portfolio will have evidence of the nature of science, approximately four tested hypotheses with aims and results, professionalism in the writing, responsibilities and development as a professional environmental scientist, and philosophical implications of environmental science in society.

The portfolio will also have a record of

- An informed decision making processes
- An informed attitude about environmental science
- A professional perspective on science
- Thoughtful insight into environmental science
- An awareness of the complex nature of science

The portfolio should be constructed as follows:

1. Environmental science assessment rubric
2. Resume
3. 1 & 3 year professional plan with expected dates of completion (be specific)
4. Issues discussed in environmental science (be specific)
5. Scientific tests performed as a class and the implications
6. Independent scientific tests and assessments
7. Personal papers, presentations, and reflections
8. Lab group papers, presentations, and reflections
9. Professional experiences, internships, and field work

Materials, which go into the portfolio, must be your own work due to the professional intent of the portfolio.

The portfolio will be assessed for both breadth and depth of the covered work. This assessment will include a check on the frequency and consistency of high quality entries, completion of scientific field work, laboratory tests, comprehensiveness, qualitative assessment based on the critical reviews of assessments (see handout of critical thinking skill-set). The depth of critical thinking and reflection will be evident when the portfolio is read. In other words, both analytical and synthetic thought will be evident upon reading. The portfolio should be organized, sequenced, and bulleted with headings and subheadings. The portfolio should be typed, paginated, spell checked, and legible wherever possible. The students should keep in mind a set of environmental science standards or skill-sets that universities or employers are looking for within the portfolio.

Tentative Schedule:

Date	Field Work/Topic	Chapter/Research Reading
16-Jan	Introduction; Means & Variances	Ecosystem Concept 1; Portfolio
18-Jan	DNA Isolation and Extraction; Standard Deviation; Descriptive Statistics Review	Ecosystem Concept 1; Scientific Literature; Handouts
23-Jan	Personal Project; Matter, Chemistry, Environment, Energy, Abiotic Factors, Biotic Factors, Evolution	Earth's Climate System 2; Floristic Quality Assessment; Personal Project
25-Jan	PCR and Amplification/Fungal ID Microscopy; Simpsons Index; Winter Ecology; Types of Variables	Earth's Climate System 2; Scientific Literature; Handouts
30-Jan	PCR and Amplification/Fungal ID Microscopy; Biodiversity, Levels of Organization; Correlation	Geology and Soils 3; Personal Project
1-Feb	PCR and Amplification/Fungal ID Microscopy; Population Ecology; Mean, Median, Mode **Exam 1**	Terrestrial Water and Energy Balance 4; Personal Project
6-Feb	Winter Severity Indices and Fruiting Behavior; Community Ecology; Regression	Terrestrial Water and Energy Balance 4; Personal Project
8-Feb	PCR Cleanup and Sequencing/Microscopy; Inferential Statistics; R^2	Carbon Input to Terrestrial Ecosystems 5; Scientific Literature; Handouts
13-Feb	Ecosystem Ecology; Shannon-Weaver Index; Strength of Selection	Carbon Input to Terrestrial Ecosystems 5; Personal Project
15-Feb	Ecosystems; Species/Area Distribution; Frequency Dependent Selection	Terrestrial Production Processes 6; Personal Project
20-Feb	Fungal Ecology and Forest Distribution; Microscopy; Inclusive Fitness	Terrestrial Production Processes 6; Scientific Literature; Handouts
22-Feb	Fungal Ecology and Forest Distribution; Microscopy;	Terrestrial Decomposition 7; Scientific Literature; Handouts
27-Feb	Fungal Ecology and Forest Distribution; Microscopy; **Exam 2**	Terrestrial Decomposition 7; Scientific Literature; Handouts
1-Mar	3D Zonation, Scale, and Species Density; Mark Recapture	Terrestrial Plant Nutrient Use 8; Scientific Literature; Handouts
6-Mar	3D Zonation, Scale, and Species Density; Mark Recapture	Terrestrial Nutrient Cycling 9; Scientific Literature; Handouts
8-Mar	Ungulate Ecology and the Matrix; Meta-habitat; Life Tables, Delayed Density Dependence	Terrestrial Nutrient Cycling 9; Scientific Literature; Handouts
13-Mar	Spring Break	Spring Break
15-Mar	Spring Break	Spring Break
20-Mar	Ungulate Ecology and the Matrix; Meta-habitat; Understanding Statistical Significance	Trophic Dynamics 11; Scientific Literature; Handouts
22-Mar	Forests, Forest Management, Microbial Ecology, and Soils; t-Test	Trophic Dynamics 11; Personal Project

27-Mar	Nutrient Cycling; Soils; 3D Ecology; Chi-square test	Community Effects on Ecosystem Processes 12; Personal Project
29-Mar	Nutrient Cycling; Soils; 3D Ecology; Non-normal Distribution	Community Effects on Ecosystem Processes 12; Personal Project
3-Apr	Microscopy; Character Assessment; Calculating Species Diversity	Temporal Dynamics 13; Scientific Literature; Handouts
5-Apr	Microscopy; Morphospecies; Jacard's Index; **Exam 3**	Temporal Dynamics 13; Scientific Literature; Handouts
10-Apr	Alpha, Beta, and Gamma Diversity as it relates to microbes; Trophic Efficiency	Landscape Heterogeneity and Ecosystem Dynamics 14; Scientific Literature; Handouts
12-Apr	Community Structure; Food Webs, Trophic Levels, Keystone Species, and Ecological Complexity or "You catch the fish the stream has to offer."	Landscape Heterogeneity and Ecosystem Dynamics 14; Personal Project
17-Apr	Personal Projects; Supply Literature: Organisms	Global Biogeochemical Cycles 15; Scientific Literature; Handouts
19-Apr	Personal Projects; Supply Literature: Community	Global Biogeochemical Cycles 15; Scientific Literature; Handouts
24-Apr	Personal Projects; Supply Literature: Results	Managing and Sustaining Ecosystems 16; Scientific Literature; Handouts
26-Apr	Phylogenetics/Microscopy; ENTREZ	Managing and Sustaining Ecosystems 16; Scientific Literature; Handouts
1-May	Lab Practical: Laboratory Clean-up, **Exam 4**	Scientific Literature; Handouts
3-May	Final Lab Meeting Portfolio Assessment	Follow-up for Sequencing Analysis Post Class: If Interested.

** Scientific papers and additional chapter sections are required for each topic and will be discussed as needed for student hypothesis testing.

<u>Important Dates</u>

***: Refer to the Deans' web page

Please acknowledge the content of the syllabus on JetNet with the following:
I have read the BIO 258 course information packet (course information, course calendar, and academic honesty policy). I understand the information they contain.