



## **Field Research in Tropical Biology**

*(Duke University BIO - 281LA)*

Fall 2017

### **Course Description**

This course is an introduction to research design, field methods, and basic data analysis in a tropical context. Hypothesis testing and statistical analysis, including orientation to basic software packages, are emphasized in the course. Students participate in faculty-guided field problems, which require working together in small groups. Students also design, implement, and analyze their own field projects. The course takes an iterative approach to teaching research design. While learning to ask and answer scientific questions, students also learn about the ecology of the organisms they work with.

In faculty-led projects, resident or visiting faculty select the questions and guide the students through the process of identifying hypotheses, designing field experiments, and interpreting data. Projects are designed to familiarize students with interesting questions and organisms, as well as to give students experience with a diversity of research approaches. Some projects are long-term and on-going projects while others may be one-time investigations of tropical phenomena in the area of expertise of the invited faculty. These group projects also give students an opportunity to learn about professional collaboration, and to work together gathering and analyzing data. A small subset of students will be responsible for writing up one faculty led project during the semester. These students are expected to work closely with the leading faculty in project design, implementation, interpretation, and the presentation of results. Faculty led projects are presented orally in the format of a scientific presentation and as a written report. Students are assigned to their FLP groups by the course faculty at the beginning of the semester.

During the semester, students complete one student-driven research project. Students either work individually or in groups of up to three people to choose a question, develop hypotheses, design, and implement the study. Like the faculty-led projects, the student-driven project is presented both orally and as a written scientific paper. The student driven project will be shared with the local community as a poster presentation. Faculty will provide close mentoring throughout the process of experimental design, implementation, and analysis. Students present research proposals to faculty for approval and then meet regularly with an assigned faculty mentor to give updates and seek advice. Faculty read first drafts of the resulting papers and students make revisions for the final write-up.

Students also participate in discussions of the ethical issues that often surround scientific research in general, and field research in the tropics in particular.

### **Goals**

1. Students learn how to conduct an ecological study in the field in the current topics of research.

2. Students will understand ethical issues in biological research and environmental conservation.
3. Students will attain skills that are important for field ecology.
4. Communicating science and ecology to a broad audience.

### **Specific Objectives and Skills**

By the end of the semester, students will be able to:

1. Articulate an ecological question in a way that can be addressed using the scientific method.
2. Generate testable predictions from hypotheses.
3. Design and implement a study to test hypotheses.
4. Apply appropriate statistical tests.
5. Interpret results in the context of published literature.
6. Understand plant and animal manipulation ethics.
7. Understand the necessity to comply with research permit from the host country and international agreements.
8. Explore the role of scientists as advocates in public policy.
9. Understanding challenges and responsibilities of doing research abroad.
10. Use common field methods in data collection.
11. Improve quantitative and qualitative observational skills.
12. Develop collaborative skills in a team environment.
13. Present results in oral, written and poster form to a broad scientific audience.
14. Students communicate to a non-scientific audience.

### **Faculty**

J. Mauricio Garcia-C., Msc. Guest lecturers and local stakeholders also participate in the course.

### **Readings/Textbooks**

H. W. Ambrose and K. P. Ambrose 1987. A Handbook of Biological Investigation. 4th edition.

Zar, J. 2010 Biostatistical Analysis 5th Edition

Avery, G. 2010 Scientific Misconduct: The Manipulation of Evidence for Political Advocacy in Health Care and Climate Policy. Cato Institute.

Moreno, E. and J. M. Gutierrez 2008. Ten Simple Rules for Aspiring Scientists in a Low-Income Country. PLoS.4(5)

Minteer, B. A. and J. P. Collins 2005. Why we need an “ecological ethics”. Front Ecol Environ 3(6): 332-337.

Animal Behaviour 2012. Guidelines for the treatment of animals in behavioural research and teaching. Animal Behaviour 83: 301-309

Primary literature and review articles are use throughout the development of the different projects.

### Course Evaluation

	<u>% Final Grade</u>
Statistics Exercises (Las Cruces, Cuerici)	6
Faculty-Led Projects (Palo Verde, Las Cruces, Bocas del Toro)	
- Participation	4
- Scientific Paper (written as group paper)	6
- Oral presentation	5
Student Driven Project Write up (Las Cruces)	15
- Draft Scientific Paper	10
- Final Scientific Paper	5
Student Driven Project (La Selva)	
- Participation	5
- Draft Scientific Paper	10
- Final Scientific Paper	20
- Oral Presentation	5
Poster and Poster Session	4
Ethics Discussions	
- Presentation of your topic and leading your discussion	5
- Participation in all discussions	5

*Statistics exercises-* Classroom or homework exercises help students familiarize themselves with basic statistical tests, and how one runs them using JMP statistical software. Topics covered include, but are not limited to probability, Chi-Squared tests, T-tests, ANOVA, Regression, Correlation, Multivariate Analyses, and Non-Parametric analyses.

*Project participation-* Students are expected to participate fully in all aspects of independent projects and faculty led projects. This includes spending appropriate amounts of time in the field collecting data, and putting in honest effort in group situations.

*Written reports-* Students work in a group to write up one faculty led project during the semester. For independent projects, each student is required to write an individual paper, even if the project was a collaborative effort. Papers are in scientific paper format. For independent projects, papers are submitted first as a draft which is corrected and returned. Students make changes to the draft according to the feedback on the paper, and hand in a final version.

*Oral presentation-* Oral reports follow the format of talks given at scientific meetings and should be a synopsis of the written report. Presentations are usually done in Power Point, which means they can include graphs and pictures.

*Poster Session-* For the student driven projects (La Selva) students will present their results to the public in a poster session. The objective is to communicate science to a general audience and the local community.

*Ethics seminar-* The ethics seminar is designed to introduce students to some of the philosophical, political and practical issues that surround scientific research. During the first weeks of the program, students choose a topic (such as “biopiracy”, “scientists as policy advocates” etc.) provided by the faculty. Students then work in small groups using the internet to find a few case studies relevant to the topic, and to develop a short presentation (15 minutes) that summarizes the case studies and then lead the class in a discussion of the topic. Total presentation and discussion time = 1 hour.

### *Grading*

Course grade (%)	Letter grade
97-100	A+
93-96.99	A
90-92.99	A-
87-89.99	B+
83-86.99	B
80-82.99	B-
77-79.99	C+
73-76.99	C

### **Statement of Accessibility**

This class represents an environment that is open and welcoming to all students. If you believe you may need accommodations during the class that may not traditionally be available, please contact any of the instructors within the first week of the course to plan a way to meet these needs within the potential logistical restrictions posed by a field course. Please communicate with us openly and recognize that accommodations are collaborative efforts between students and faculty.

### **Statement of Expectations for Student Conduct**

We expect you to conduct yourself in a professional, honest, and ethical manner and adhere to Duke University’s academic policies. As such, you will be held to the highest standards regarding academic integrity. Academic dishonesty includes: lying (communicating untruths or misrepresentations); cheating (using unauthorized materials, information, or study aids); fabrication (falsifying or inventing information); assisting (helping another commit an act of academic dishonesty); tampering (altering or interfering with evaluation instruments and documents); plagiarism (representing the words or ideas of another person as one's own); and stealing (appropriating the property of another without permission). For additional information about academic dishonesty at Duke University, please go to <https://studentaffairs.duke.edu/conduct/z-policies/academic-dishonesty>

## **Additional Policies & Procedures**

The Organization for Tropical Studies and Duke University complies with and will comply with all applicable federal, state, and local laws, regulations and guidelines in addition to policies and procedures outlines in the Duke University Undergraduate Catalog.

### American with Disabilities Act

“Duke University does not discriminate on the basis of an individual’s disability and complies with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act in its admission, accessibility, treatment and employment of individuals in its programs and activities. The University provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law, who are otherwise qualified to meet the institutions academic and employment requirements. For more information, visit or call the Center for Students with DisABILITIES. For more information on University policies and services to students with disabilities, see the Undergraduate Catalog.

### Additional Notes on Academic Dishonesty

Academic dishonesty (i.e. plagiarism, cheating) will not be tolerated. Any person suspected of academic dishonesty will be subject to the policies and procedures set forth by Duke University as outlined in the Undergraduate Catalog.

### Statement on Plagiarism

Plagiarism is define as taking the words or ideas of another person and using them without citation as though they were your own. As such, acts of plagiarism include using song lyrics, words from an interview, words or ideas from a conversation or in-class discussion, words from a lecture by a professor, jokes from a comedian, or lines from a movie or dramatic play. Other sources of plagiarism will be articles from peer-reviewed journals, news sources, books, or magazines, in a scholarly work of your own without crediting their place or person of origin. In this class, students will be expect to properly cite all sources from which words, information, and ideas in their papers come, including quotation marks for precise wording and in-text citations for all ideas, as well as a full bibliography at the end of the paper. As we will be using APA style, please consult the APA website, <http://www.apastyle.org/>, for specific instructions on proper citation.

According to the Duke University policy on plagiarism, students found to have plagiarized in classwork or written assignments will be given a grade of “F” for the paper on which they have been found to have plagiarized and may be subject to an official investigation of their academic honesty by the University. This investigation, even if the student is found to have been innocent, will be permanently documented on the student’s academic transcript. If you are uncertain about the citation criteria for an idea in your paper, please see the instructor and ask before submitting. Your honesty is greatly appreciated, and will serve you in all of life! For more on University policies regarding plagiarism please see the handbook.

### Class Attendance & Authorized/Religious Absences

Regular and punctual attendance is expected. Attendance begins on the first day of class. Attendance is taken every class period. Class attendance is essential for participation, performance, and intellectual progress. Attendance is generally an indication of how serious of a student one is, and will most likely account for the success, or lack of success, of a

student. In this class, attendance is a symbol of participation, which represents part of your grade. Notes taken during class will enhance that physical presence by allowing you to capture essential information, meaning, and details of the course. University authorized absences and religious absences are provided in accordance with Duke University policy and state law.

### Acting Responsibly

Any acts of misconduct as defined by the Student Code of Conduct, which is available from the Duke University Dean of Students Office, will be referred to the University and may be subject to the university Code of Conduct and Discipline.

Please remain respectful of others' time. Turn off cell phones, let others speak, and be on time to class, field trips, and activities. Tardiness is inconsiderate and unacceptable. Please let us know if you will not be able to make it to class. It is your responsibility to obtain notes from a classmate for any missed time.

Also, please mind your food and drinks. Avoid creating disruptions related to eating/drinking during class or other activities. Avoid spills, crumbs, etc. and clean up after yourself immediately. Remove any trash you or others create.

Finally, an essential element to successful class meetings is your preparation. Please read and complete assignments on time, and be prepared for class participation and discussion. We will do everything in our power to provide you with a positive and inclusive learning environment and will guide and assist you in your learning experience. However, ultimately, your education is your responsibility. Please take this responsibility seriously.