



## **Fundamentals of Tropical Biology**

(Duke University - BIO 280A)

Fall 2017

### **Course Description**

This course integrates classroom and field instruction to introduce students to the fundamental principles of tropical biology and the natural history of local plants and animals. The ecological complexity of the tropics, the patterns of species diversity and the types of species interactions that characterize these systems are discussed in detail. Classroom instruction includes lectures given by resident and visiting professors, as well as discussions of assigned readings and selections from the primary literature.

Fieldwork is an important component of the course. During the semester, the course visits OTS research stations as well as external sites, to cover a wide variety of ecosystems, which include the tropical wet forest, dry forest/wetland, premontane wet forest, cloud forest, páramo, oak forest, mangrove forest, and a marine site. Field orientation at each site includes the identification and natural history of important plant and animal species. Orientation activities also serve to stimulate questions that students may address in subsequent student-led research projects. Developing the skill of keeping good field notes is important in order to have an easily accessible record of what students learn or observe at each site.

### **Goals**

1. Identify and understand key processes influencing biodiversity and ecosystem dynamics in tropical habitats.
2. Distinguish between diverse tropical ecosystems and identify the key characteristics of lowland wet forest, dry forest, major wetland ecosystems, montane forest, and *páramo*.
3. Identify secondary forest from old growth forest by looking at the plant growth forms and plant characteristics.
4. Understand the basic natural history of important plant and animal taxa and identify important plant and animal groups associated with each of the major ecosystems visited.
5. Communicating discoveries of natural world to a broad audience.

### **Specific Objectives and Skills**

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

1. Explain hypotheses concerning the origins and maintenance of tropical biodiversity.
2. Classify the different types of species interactions based on the benefits and costs, and for participants to give tropical examples.
3. Identify community level interactions with emphasis on tropical ecosystems.
4. Give examples of adaptations to various tropical environments and understand the roll of biotic and abiotic factors.
5. Identify most common orders and families of tropical insects and learn about ecology of different families.
6. Identify the most representative plant families in each tropical ecosystem.
7. Develop detailed observation skills.
8. Gain an appreciation for the diversity of tropical ecosystems.
9. Gain an appreciation of the difficulties in communicating science and be effective.

## Faculty

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

## Readings/Textbooks

Breeze et al. 2011. Pollination services in the UK: How important are honeybees? *AgriEcosystEnv* 142:137-143.

Brosi and Briggs. 2013. Single pollination species losses reduce floral fidelity and plant reproductive function. *PNAS*. 110(32):13044-13048.

Enquist 2002. Predicted Regional Impacts of Climate Change on the Geographical Distribution and Diversity of Tropical Forests in Costa Rica. *JBiogeog.* 29(4):519-534.

Guimaraes et al 2008 Seed Dispersal Anachronisms: Rethinking the fruit extinct megafauna ate. *PlosOne* 3(3):e1745.

Janzen & Martin. 1982 Neotropical anachronisms: the fruits the gomphotheres ate. *Science* 215:19-27.

Kricher, J. 2017, *The New Neotropical Companion*.

Lamarre et al. 2014 Leaf synchrony and insect herbivory among tropical tree habitat specialists. *Plant Ecology* 215:209-220.

Memmott et al. 2007 The Conservation of Ecological Interactions. In Stewart A. J. A. et al. (eds) *Insect Conservation Biology*, Chapter 10. pp. 226-244.

Siikamaki et al. 2012. Global economic potential for reducing carbon dioxide emissions from mangrove loss. *PNAS* 109(36):14369-14374.

Primary literature and review articles are also assigned throughout the course. A schedule of reading assignments is provided at the beginning of the semester. Readings take two forms: those that are intended to reinforce class material by presenting the subject in a different framework, and those that are intended to complement and add to material presented in class by expanding on a particular topic.

## Class Meeting

A detailed calendar with topics, instructors, and meeting times will be posted at each site. However, scheduling is subject to change due to unforeseen circumstances typical of a field course (e.g. weather, last-minute cancellations, etc.). Meeting locations will be specified upon arrival at each site.

## Course Evaluation

	<u>% Final Grade</u>
Three Exams (15 point each)	45
Laboratory Assignments	
Plant Keys (3 sites)	15
Insect IDs (3 sites)	15
Field Notebooks (4 sites)	10
Participation	15

### *Exams*

There will be three short exams during the semester. Exams will cover material presented in class, in readings, and during laboratories, activities, and field trips. Exams questions may take a number of formats, but are typically short-answer questions. Exams are intended to encourage you to review the information presented and demonstrate to the instructors your understanding of and ability to synthesize course material. We will make every effort to grade exams within a reasonable time frame. After exams are handed back to students will be advised of the time period during which you may review your answers and ask questions. This time frame is typically one week. All appeals regarding grading decisions should be made within this time frame.

### *Laboratory Assignments*

The course includes taxonomy exercises to give students a practical understanding of tropical diversity across different ecosystems, practice in observing differences in plants and insects, and skills in collecting. The exercises also give students hands-on practice in applying the concepts of species identifications. At each of 3 sites students will select plants specimens in different families and construct a dichotomous key using accepted morphological features. Insect identification exercises will consist of students handling in identified insects across a broad range of orders and families. The insect identification can be accomplished by any means available to you, except having another person identify it for you. You are on your honor to do your own collecting and identifications. Euthanizing insects is not necessary for completing this assignment.

### *Field Notebooks*

Most field researchers and naturalists find keeping a field notebook to be a useful tool for recording interesting observations which they can refer back to for later comparisons or research ideas. To explore the usefulness of this tool, students are required to keep a field notebook throughout the semester. At a minimum, students should include an entry of a half hour observation at four sites. All entries should include date and location and anything else that may be considered important such as climate, time, temperature etc. Observations can include drawings and species lists. Additional information that students may want to include in their field notebooks are observations from field trips, orientation walks, plant taxonomy exercises, etc. Field notebooks will be collected after each field stations visit during the course and graded based on completeness, neatness, and effort. A more detailed handout on field notebook requirements will be distributed once classes begin.

### *Participation*

Participation includes attendance of lectures, workshops and field trips, completion of assignments, positive contributions to discussions and lectures, listening to others, and demonstration of academic initiative and enthusiasm in the field as well as in the classroom.

### *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.