BSC 311 – Rain Forest Ecology

Monday & Wednesday 2:00 -2:50 PM, FSA 129; Field Trip Nov. 15 through Nov. 27, 2018

Introduction to the natural history and biology of the tropical rain forest community involving intensive tropical field work and investigative learning.

Instructors: Dr. Rachel Bowden (SLB 244, 438-83834 rmbowden@ilstu.edu)
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Optional Reference Books:

The New Neotropical Companion. 2017. John Kricher. Princeton University Press.
Tropical Ecology. 2011. John Kricher. Princeton University Press.
La Selva: Ecology and Natural History of a neotropical rainforest. 1994. L. McDade et al., University of Chicago Press
Costa Rican Natural History. 1983. D. H. Janzen (ed.)., University of Chicago Press, Chicago

Readings for class discussion and other assignments, including primary literature, will be provided as hard copies or electronically as pdfs posted to ReggieNet.

General Description:

This class will meet 2 hrs a week during the regular semester for a seminar discussion based on readings from the primary literature to provide background on rain forest ecology and natural history, and to begin developing research ideas. During the semester you will make written and oral presentations on research topics, and write a proposal for a project you will do while in Costa Rica. Orientation to Latin America, Costa Rica, and to foreign travel will also be provided. The field trip will depart ISU on 15 November, the week before Thanksgiving for an 12 day field trip to the Organization for Tropical Biology's La Selva Biological Station at in northeastern Costa Rica. **Our confirmed Itinerary is provided on the last page.**

Cost:

The cost of the trip is $2625.84 per participant. You may regard this as the **Final/Firm** cost. This cost includes round trip transportation, all meals (except for the final day in San Jose and meals in transit), lodging, field station fees, Costa Rican collecting permits, Costa Rican Exit Tax, and miscellaneous fees. Your own discretionary personal expenses, boots, flashlight, and other supplies, excess checked baggage, and tuition costs are not included. Your $225 application fee and the $300 airfare deposit goes toward that total cost. **The balance is due in two installments: $608.10 for the airfare balance due on Monday 20 August, and paid by check to: Biological Sciences, Illinois State University. The remaining costs appear on your ISU student accounts bill.** Ask your instructors if you have questions.

Other Requirements:

Valid U.S. passport, or valid non U.S. passport with any necessary Costa Rican visa; Wellington boots; flashlight. The course prerequisite is BSC 201 (Ecology) or equivalent [concurrent registration acceptable].

Course Description: The field of Tropical Ecology is the study of the biotic and abiotic interactions that shape the origin, maintenance, and consequences of species diversity in the tropics. The extremely high species diversity found in tropical forests has fascinated biologists for centuries, including Humbolt, Darwin, Wallace, and many others. Tropical forests and their diversity continue to engage biologists today. This course provides a general overview of tropical rainforest ecosystems, natural history, biological communities, and their structure and functioning. Although the examples used in the course will be drawn from a variety of tropical ecosystems, the course will focus primarily on the Neotropics.

A further major goal of the course relates to the scientific method, focusing on clearly articulating scientific arguments in writing and presentations, to be able to find pertinent, up-to-date data, and to evaluate critically original scientific literature. Students will be guided in developing, presenting, and conducting their own individual research project, which will be carried out at La Selva Biological Station in Puerto Viejo de Sarapiqui, Costa Rica. Orientation to Latin America, Costa Rica, and foreign travel will also be provided.

Content Objectives: (specific student outcomes expected) This course will help you develop an understanding of:

1. tropical ecosystem structure and function
2. the role of evolution in the development of tropical ecosystems

3. species diversity and ecological interactions in tropical forests
4. the value and conservation of tropical rainforests

Skill Objectives: (specific student outcomes expected)

1. Develop the ability to find, read, discuss, and refer to scientific literature
2. Improve your ability to conduct biological research, including:
    a. developing hypotheses
    b. experimental design
    c. overcoming failure
    d. data analysis and display
3. Develop your presentation and writing skills

A variety of activities throughout the semester will contribute to your ability to achieve these skill objectives. This course is structured to allow for as much opportunity as possible for discussion, interaction, and hands-on work. During these activities you will be able to learn new things, apply your knowledge in new situations, and practice and get feedback on your writing and presentation skills from instructors and from your student peers. You will also provide feedback on writing and presentations to your peers in the course.

Evaluation:

Class participation; written research proposal; small written assignments; oral presentations on assigned topics, proposed research, and final project results; professionalism in the field; journal notebooks;knowledge demonstrated in the field; research project effort; and quality of implementation of advice on data analysis and presentation will be evaluated to determine a grade. With respect to field research, quality of the question, creative experiments and use of materials, effort, execution, and evidence of biological understanding are more important than actual research results. Journal notebooks (see below) are expected to have individual entries for each topic, each item (natural history observations, field notes, data, ideas, personal thoughts and reactions, etc.). A format example will be provided. For assistance with data analysis, see your instructors or TAs. Final presentations will be in constructed in PowerPoint or other presentation software. If you are unfamiliar with its use, your instructors and TAs will assist.

Specifically your course grade will be based on the following elements:

Assignment/Task/Activity	Description (full descriptions & instructions given in class)	% of final grade
La Selva Research Examples	Powerpoint (or similar) presentation based assignment on a journal article published on research carried out at La Selva.	5
Ecological Concepts	Powerpoint (or similar) presentation and written assignment in which you explore a particular ecological concept.	10
Research Proposal Draft	3 page (single spaced) **research proposal** on your chosen topic. Proposals will synthesize current knowledge on the topic, address its significance in a broader context, and make the case for the specific research project. It should test novel ideas, and include these sections: **Conceptual Background; Hypotheses; Study organisms; Methods; Data Interpretation; Literature Cited.** We will provide you with some example proposals. Draft proposals will be evaluated by us and your peers, allowing you to improve the project and the writing and submit a final version before the trip.	10
Proposal Peer Review	Written peer review of two other proposal drafts.	5
Research Proposal Presentation	Powerpoint (or similar) presentation of proposed research.	10
Final Research Proposal	Final proposal incorporating relevant suggestions given on the draft and during peer review.	20
Final Project Presentation	Scientific presentation of your research project in **Finals Week.**	20
Field journal	See details below.	5
Class and field participation, effort, and professionalism		15

Students performing below the C level may not be allowed to participate in the Costa Rican field trip. Students will receive formative evaluations of their performance at regular intervals or when the instructors deem it necessary.

Conduct: Rules of conduct and expectations of student behavior are provided for the purpose of aiding the instructors in conducting a safe and educationally fruitful foreign field trip. Students who routinely perform below average, fail to follow directions, heed warnings, follow travel instructions, meet deadlines, disrupt class, whine or whinge, or generally fail to function in a collegial manner can be prevented from participating in the course field trip. Those doing so on the trip may be sent home.

Field Data Notebook: A field notebook will be provided forstudents to record their investigative studies. The nature of the question, your ideas about solving the problem or answering the question, your actual approach, the data you collected, your analysis of the results, and the conclusions reached will all be recorded in a neat orderly manner. Each entry will be titled with date & time.

Journal/Notebook: All field trip participants will be expected to keep a journal/notebook, provided by the student themselves, with:

1. personal observations & commentary (optional)
2. natural history observations
3. investigative questions and conclusions obtained during the field trip.

Famous naturalists like Darwin and Wallace kept exceedingly detailed notes, and of course, they published their experiences as books. Rainforests are full of interesting and wonderful things, but observations are quickly forgotten if not recorded. Students are expected to devote at least half an hour each day to journal entries. Daily observations of interesting biological phenomenon should be recorded, after which further information on what is known about what was observed can be also included (e.g. from library and reference books). In addition, it should be considered what of interest could be studied. What interesting questions does the observation raise? What could be done to initiate study of such a phenomenon? Thinking like a biologist takes practice.

Examples of journal entries

17 Nov, 8:08 am - Tree iguana (a natural history entry)

A large tree iguana, (*Iguana iguana* - hard to remember!) is perched on a branch just to one side and above the suspension bridge. He is huge, maybe 1.5 m long, nose to tail. He was raising and bobbing his head displaying a huge colored flap of skin under his chin & throat. This flap is called a dewlap, & males use it to display to attract females & guard territories from other males. Otherwise he doesn't seem to move much. Wonder when they eat? Do they move around & eat at night, returning to a display perch by day? Or do they have such a low metabolism that they just don't do much? Maybe observations tonight will tell. Can we estimate a territory by looking at the spacing of the iguanas in the tree canopies?

17 Nov, 10:05 am - Tree gaps (natural history & investigation)

Why are tree gaps important in rainforest ecology? Obviously they let in light & light is important for plants. But how much more gets in? We will use a light meter to measure sunlight intensity in the open and then under the closed rainforest canopy. Then we will measure light across a tree gap & see how it changes. The following data will be recorded in footcandles …

18 Nov, AM - Weather (a personal commentary)

Rain, rain, rain! & just when I thought it couldn't rain any harder, the rain got even heavier. Tropical rains just come straight down, suddenly, but no wind, no thunder, no lightening, and they are warm. This really convinces me that this is a rain forest. Don't know how much rainfall there has been today, but it must be a lot. Some of the trails and low-lying areas are flooded; the streams rise impressively in a very short period of time. Stay out of creeks & such if it rains. Now I understand the rubber boots & umbrellas! Not many organisms around in heavy rain. We will check the rise in water level in the frog swamp later by marking the level & time on a hand rail post.

Course Schedule
Bold type = assignment to be turned in

Date	Topic/Activity	Readings (provided) and Assignments Due
20-Aug-18	Short meeting	
22-Aug-18	Introduction, Logistics, Organization	A Neotropical Companion, Appendix "And hey, lets be careful our there"; Questions
27-Aug-18	Designing a Research Project	Read example proposals
29-Aug-18	Structure of Rainforests	Tropical Ecology, Ch. 3 + paper
3-Sep-18	Labor day no classes	
5-Sep-18	La Selva Research Presentations	Assigned papers; 5 minute presentations
10-Sep-18	Species Diversity: Patterns & Hypotheses	Tropical Ecology, Ch. 4 + The New Neotropical Companion, Ch. 9
12-Sep-18	Evolutionary Dynamics in the Rainforest	Tropical Ecology, Ch. 7 + paper
17-Sep-18	Ecological Concepts Presentations (1)	6 minute presentations; 1 page summary due
19-Sep-18	Ecological Concepts Presentations (2)	6 minute presentations; 1 page summary due
24-Sep-18	Rainforest development and dynamics	Tropical Ecology, Ch. 6 + paper
26-Sep-18	Present two testable hypotheses and predictions, with supporting literature (1)	Bring supporting primary literature, written hypotheses (3 sentences each), sketched predictions plot
1-Oct-18	Present two testable hypotheses and predictions, with supporting literature (2)	Bring supporting primary literature, written hypotheses (3 sentences each), sketched predictions plot
3-Oct-18	Big picture question, specific hypotheses, and methods peer review (1)	Bring methods outline bullet points to discuss
8-Oct-18	Big picture question, specific hypotheses, and methods peer review (2)	Bring methods outline bullet points to discuss
10-Oct-18	Carbon flux & climate change in the tropics	Draft proposals due; Tropical Ecology, Ch. 9 + paper
15-Oct-18	Peer review of proposals	Peer reviews due
17-Oct-18	Peer review of proposals	
22-Oct-18	Formal presentation of research plan	8-9 minute presentations
24-Oct-18	Formal presentation of research plan	8-9 minute presentations
29-Oct-18	Formal presentation of research plan	8-9 minute presentations
31-Oct-18	Tropical soils and nutrients	Tropical ecology, Ch. 10 + paper
5-Nov-18	Human Ecology in the Tropics	Tropical Ecology, Ch. 13
7-Nov-18	Costa Rican & La Selva History	Final proposals due; Final equipment & supplies list due; Koens et al., 2009 + La Selva, Ch.2
12-Nov-18	The Future of Neotropics	The New Neotropical Companion, Ch. 18
14-Nov-18	Rainforest etiquette, Last minute preparation	The New Neotropical Companion, Ch. 4
15-Nov-18	**Depart for Costa Rica**	
27-Nov-18	**Return from Costa Rica**	
28-Nov-18	Answering questions, data entry & analysis	
3-Dec-18	Data entry and analysis	Journals due
5-Dec-18	Result slide presentation and review	Draft results slides
Finals Wk.	Presentations (Dates and times TBD)	Final presentation

The field trip will depart ISU on 15 November, the week before Thanksgiving for an 12 day field trip to the Organization for Tropical Biology's La Selva Biological Station at in northeastern Costa Rica. **Our confirmed Itinerary is as follows:**

Itinerary

Thursday, 15 November 2018

Delta Air Lines Flight 5034
Bloomington-Normal Airport (BMI) to Hartsfield-Jackson Atlanta International Airport (ATL)
Departs 6:00am (CST) **Arrives** 8:47am (EST) Flight Duration: 1 hour 47 minutes

Delta Air Lines Flight 900
Hartsfield-Jackson Atlanta International Airport (ATL) to Juan Santamaria International Airport (SJO)
Departs 9:46am (EST) **Arrives** 12:46pm (CST) Flight Duration: 4 hours

Bus: From Juan Santamaria International Airport to La Selva Biological Station

Friday, 16 November 2018 to Monday 26 November 2018: At La Selva Biological Station

Monday, 26 November 2018

Bus: From La Selva Biological Station to Hotel El Presidente, San Jose

Tuesday, 27 November 2018

Bus: From Hotel El Presidente to Juan Santamaria International Airport

Delta Air Lines Flight 903
Juan Santamaria International Airport (SJO) to Hartsfield-Jackson Atlanta International Airport (ATL)
Departs 2:00pm (CST) **Arrives** 7:04pm (EST) Flight Duration: 4 hours 4 minutes

Delta Air Lines Flight 5219
Hartsfield-Jackson Atlanta International Airport (ATL) to Bloomington-Normal Airport (BMI)
Departs 9:16pm (EST) **Arrives** 10:10pm (CST) Flight Duration: 1 hour 56 minutes