



UNIVERSIDAD SAN FRANCISCO DE QUITO
SCHOOL: CIENCIAS BIOLÓGICAS Y AMBIENT.
COURSE: ECL-0390E -

Semester: 201910 - Primer Semestre 2019/2020 - NRC: 1006

Schedule: LMIJV : 9:00-12:00; 15:00-17:00- : (Aula -) GSC- Salón de la Comunidad

INSTRUCTOR/TEACHER INFORMATION:

Professor: Carlos A. Valle

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Office: D 214 AND GSC, 3rd Floor, San Cristobal, Galapagos

Office hours: M, T, W, Th, F: 9:00-10:00; at any time if you ask for it (except from 1:00-2:00PM!).

COURSE INFORMATION:

Credits: 4

Pre-requisites: Verify pre-requisites in Banner academic system.

Co-requisites: None

COURSE DESCRIPTION:

This is an intensive hands-on course where students learn basic statistical methods, the basics for designing and conducting experiments in the field and will collect and analyze their own data under the supervision of the professor. A good theoretical background is fundamental for ecological research. However, ecology cannot be done just in the computer lab. Real ecologists must get immerse in the field. A field-oriented course like this will provide students with a truly opportunity to learn the basics for scientific research which involves the process of formulating sound, interesting and relevant research questions, formulate hypothesis and design "experiments" or field studies for hypothesis testing. Furthermore, this course will take place in the Galapagos Islands a "perfect microcosm" for the study and understanding of the evolution of life-history strategies, animal behavior and ecological adaptations.

Through the course, students will be introduced into the fundamental concepts of hypotheses formulation, experimental design and hypothesis testing using real data collected by themselves as part of the course under the advice and supervision of the professor. The course will be a combination of in-the-classroom lectures (45% of the time) and in-the-field work (60%). However, be prepared because the time in the field may exceed that time stipulated for a 4-credit course. In the classroom, we will cover the fundamental concepts of experimental design, basic statistical methods (both parametric and non-parametric; time constraint prevent a foray into multivariate analyses and generalized linear models, etc.), learn or refresh the basic skills for data analyses (using a statistical program like PAST, or R) and scientific reporting and publication. All students will be part of one field research project and will present a research report.

COURSE LEARNING OUTCOMES:

#	Learning Outcomes	Level
1	Gain the insights and understanding of the fundamental principles that should guide scientific research in the field of Ecology.	Inicial



2	Learn and apply the fundamental concepts of experimental design as they applied to field of Ecology.	Medio
3	Learn and apply the fundamental statistical concepts and statistical data analysis.	Medio
4	Hands-on involvement in scientific research including research design, field data collection, data analyses and reporting.	Final
5	Ability to understand and judge results and interpretations of other researchers in the field of Ecology.	Final

COURSE CONTENTS:

Research Design and Sampling

1. The Scientific Method in Ecology
2. The Research question/problem and Hypotheses formulation
3. A brief introduction to Experimental design (EXPD): sampling unit and experimental unit, internal validity (causation), external validity (scope of inference), Fisher-Hurlbert fundamental principles of EXPD (randomization/ interspersion, local control, replication.
4. A brief introduction to EXPD: the experiment in ecology (types) and sampling methods, type of experimental design according to: spatial and temporal arrangements, type and number of variables.

Hypotheses testing and Basic Statistical Methods

5. Hypotheses testing: Types of Statistical methods, defining alfa, Type I Error type I and type II and the value of the p-values.
6. Statistical methods: frequentist statistics and alternatives to it, parametric vs. non-parametric methods
7. Statistical methods: ANOVA: student t tests (and types), One-Factor ANOVA, Repeated Measure ANOVA, Two-Factor ANOVA, Nested ANOVA, MANOVA
8. Statistical methods: Regression, Correlation and Association
9. Statistical methods: Non-Parametric Statistical methods
10. Reporting the Results of your research- tips for writing a research paper for publication
11. Using a Statistical Program (free software): R or PAST

METHODOLOGY FOR THE INTEGRATION OF THEORETICAL AND PRACTICAL CONTENTS:

The teaching methodology used in all courses at USFQ follows the liberal arts philosophy: encourage dialogue and enable learning through opportunities to exchange ideas among teachers and students. It is expected that all the theoretical content courses explore potential applications to professional practice and work contexts through the integration of diverse activities and simulations that foster the contextualized understanding of concepts using reality and professional practice as frames of reference.

ASSESSMENT:

Type of Evaluation	General Description	Percentage of the Final Grade (%)
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Comprehensive Exam	See next section	25
Field Research Report	See next section	25
Quizzes (5)	See next section	20
Performance and discipline during Fieldwork.	See next section	20
Performance and discipline in the classroom.	See next section	10

Description of Assessment Categories

Research Report

The research report will emulate a draft that will be submitted to "Ecology", a peer review journal of the Ecological Society of America (ESA). Therefore, we will strictly follow the instruction to authors submitting a paper to Ecology (see <http://esapubs.org/esapubs/journals/ecology.htm>).

The report will be individually, will be presented in a single space and contain the following sections:

- Cover Sheet: author's name, institutional affiliation, mailing address, email address.
- Abstract (<200 words)
- Introduction (1-1.5 pages maximum)
- Methods (1-2 pages maximum)
- Results (1-2 pages)
- Discussion (1-1.5 pages)
- Acknowledgments
- Literature cited (minimum 15 references)

- Tables (1-4)
- Figures (1-4)

The report should not exceed the equivalent of 7 pages of text (single-spaced) plus the Abstract, Literature Cited, Tables and Figures. The data should be organized and summarized in Tables and Figures following the style of Ecological Society of America (ESA), and should be placed next to the cited Literature. The report should be profusely referenced (no less than 15 scientific / technical articles from peer reviewed published literature). Information directly from the internet (one that is not published in a scientific journal) will only be accepted as an exception (explanation in class).

The report summarizes the most relevant result of fieldwork and statistical analyses of data collected in the field by the whole class.

The report must be a complete document and reflect the student's maximum effort. An incomplete report that does not conform to the specified style and / or is poorly worded will automatically receive a D / F grade severely affecting the grade to be earned in the course.

Quizzes:

A quick single-question test at the beginning of the morning session. A quiz will last no longer than 5 minutes and will refer to assigned reading material (textbook chapters or a paper) for that day or from material covered the class before. Missing a quiz will result in a score of zero on that quiz.



Exams

There will be one comprehensive exam on the specified date (see the chronogram). The exam will consist of a combination of short answer and essay questions.

LIBRARY BIBLIOGRAPHY:

Karban, R., M. Huntzinger and I. S. Pearse. 2014 (2nd. Eds.). How to do Ecology- a concise handbook. Princeton: Princeton University Press. MANDATORY textbook: hard copy or digital edition is fine.

COURSE BIBLIOGRAPHY:

Gotelli, N.J. and A.M. Ellison. 2013 (Second Edition). A primer of Ecological Statistics. Sinauer Associates, Inc., Sunderland, MA.

POLICIES:

All students taking courses at USFQ must follow the rules for ethics of learning, research, and behavior detailed in the [USFQ's Code of Honor and Coexistence](#). All courses should follow the policies stated in USFQ's [Manual del Estudiante](#)

ABOUT ELECTRONIC EQUIPMENT: Cell phones, iPod and other devices must be switched off in class. You can use IPAD/computers only for taking notes.

ASSISTANCE: Come to class on time. Moreover, field excursions are mandatory. In the case of illness or any other justified reason, students can be relieved from the excursion and cover the qualification with additional tasks.

MATERIALS: For excursions bring notebooks/slates, snorkeling gear, camera, hat, sunblock.

SCHEDULE OF ACTIVITIES: (September 9 – September 27, 2019):

DATE (day)	TOPIC	READINGS	FIELDWORK
	WEEK 1	(FIRST EDITION)	
Monday 9	Introduction to the course. Logistic arrangement for fieldwork. Brief introduction to the Galapagos Islands. The meaning of conducting scientific research in a protected area. Class: 9:00-12:00 15:00-16:30	Ch. 1- Picking a question.	Field excursion to Tijeretas 16:30-18:00
Tuesday 10	The Scientific Method in Ecology. The research question/problem and hypotheses formulation. Class: 9:00-12:00	Ch. 2- Posing questions (or Picking an approach).	Field excursion to La Loberia/El Barranco 15:00-17:30
Wednesday 11	Brief introduction to Sampling and Experimental Design (EXD): sampling unit and experimental unit, internal validity (causation), external validity (scope of inference). Class: 15:00-17:00	Readings to be assigned (papers in D2L)	Field work (2-3h) per day ~ 9:00-12:00
Thursday 12	A brief introduction to EXD: cont.... Fisher-Hurlbert fundamental principles of EXD (randomization/ interspersation, local control, replication).	Readings to be assigned (papers in D2L)	Field work (2-3h) per day ~ 9:00-12:00
Friday 13	A brief introduction to EXD: cont.... The experiment in ecology (types) and sampling methods. Class: 15:00-17:00	Ch. 3- Using experiments to test hypotheses.	Field work (2-3h) per day ~ 9:00-12:00
Saturday 14	Field trip 3: Espanola Island		7:00h-18:00h
Sunday 15			



	WEEK 2		
Monday 16	A brief introduction to EXD: cont....., type of experimental design according to: spatial and temporal arrangements, type and number of variables.	Ch. 4- Analyzing experimental data	Field work (2-3h) per day
Tuesday 17	Hypotheses testing: Types of Statistical methods, defining alfa, Type I Error type I and II and the value of the p-values. Statistical methods: frequentist statistics and alternatives to it, parametric vs. non-parametric methods	Ch. 5- Using surveys to explore patterns	Field work (2-3h) per day
Wednesday 18	Statistical methods: ANOVA: student t tests (and types), One-Factor ANOVA, Repeated Measure ANOVA, Two-Factor ANOVA, Nested ANOVA, MANOVA Class: *8:00-10:00		Field Trip to Highlands (Junco, Galapaguera, P. Chino) 10:00-18:00
Thursday 19	Statistical methods: Regression, Correlation and Association. Statistical methods: Non-Parametric Statistical methods.		Field work (2-3h) per day
Friday 20	Reporting the Results of your research- tips for drafting a research paper for publication	Ch. 8- Communicating what you find. Ch. 9, Conclusions	Field work (2-3h) per day
	WEEK 3		Field work (2-3h per day) extends the full week
Tuesday 24 (3:00-5:00 pm)	Final EXAM		
Saturday 28 (4:00 pm)	Students submit Research Report		

* Exact schedule to be refined first day of class (up to some level depending on whether the class participates in one or two field research projects).

This syllabus was reviewed and approved by the coordination of the respective academic area or department. All sections of this course must follow this syllabus. Any changes or adjustments to this syllabus must be approved by the coordinator responsible for this academic area or department and must be reflected in the Curricular Design system.'