

Experimental and Observational Study Design and Analysis for Environmental Scientists

EVPP 991 – Spring 2021

Syllabus

Instructor: Diego Valderrama
Assistant Professor, Environmental Science and Policy
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Classroom: Enterprise Hall 275.

Class Meetings: Wednesdays, 4:30 PM to 6:20 PM.

Office Hours: By appointment.

Course Description and Goals

The topic of this seminar is “Experimental and Observational Study Design and Analysis for Environmental Scientists”. The goals of the course are: (1) to learn the principles of experimental and observational study design; and (2) to apply these principles to a critical examination of scientific papers and to students’ own research proposals.

Course Content, Instructional Methods and Evaluation of Student Performance

The course content is laid out by week in the syllabus. The first module of the course will consist of lectures delivered by the instructor, with occasional assignments given to students. Completion of these assignments will account for 25% of the student’s final grade.

In the second module, each student will be responsible for developing a research proposal following the procedures discussed in the first module of the course. This may be their own actual research proposal or a hypothetical proposal on a topic of interest. The proposal will contain the following sections: Introduction/ Literature Review/ Hypotheses/ Experimental Design/ Methods. If a student already has a research proposal approved, they will submit a critique of it using the principles learned in the class. Students may also elect to submit an NSF-type grant proposal based on their research proposal, again applying the concepts of the course. Completion of the proposal will account for 75% of the student’s final grade.

Suggested Software (to follow up the practical examples given in class):

R, freely available at The R Project for Statistical Computing (<https://www.r-project.org/>).
RStudio (<https://www.rstudio.com/>) is strongly recommended as script manager.

TENTATIVE CLASS SCHEDULE: Subject to changes.

Date	Topic
Jan 27	Introduction to Design of Experiments.
Feb 3	Simple Comparative Experiments.
Feb 10	Experiments with a Single Factor - the Oneway ANOVA - in the Completely Randomized Design (CRD)
Feb 17	Blocking – The Randomized Block Experimental Design
Feb 24	Blocking – The Latin Square Design
March 3	Factorial Experiments
March 10	Power and Sample Size in ANOVA
March 17	Nested ANOVA – Multivariate Analysis of Variance
March 24	Analysis of Covariance
March 31	Multivariate Data Analysis / DRAFT of Intro/Lit Review of Proposal Due
April 7	DRAFT of Intro/Lit Review returned. DRAFT of Hypotheses/Research Design/Methods DUE.
April 14	DRAFT of Hypotheses/Research Design/Methods Returned
April 21	Students turn in final proposal to instructor.