Data & Analysis in Natural Sciences
[Data Analysis Nat Sci]

SYLLABUS

3 credits

FALL 2018

GLY 6932 (19161) || ZOO 4926 (21205) || ZOO 6927 (21218) || GLY 4930 (21934)

Instructor: Michal Kowalewski (kowalewski@ufl.edu), Dickinson 254 (Tel: 352-273-1944)
Lectures: MWF 210 (Williamson Hall/Geology Bldg.), MWF (3), 9:35am-10:25am
Labs: W 210, W (6-7), 12:50am-2:45pm
Prerequisites for Graduate Students: None
Prerequisites for Undergraduate Students: Consent of the instructor
Textbook Required: None (Readings will be assigned and provided in class)
Freeware: *R Studio*
Hardware: Laptop is required for lab meetings

Synopsis: This course will combine lectures and hands-on lab activities with focus on practical applications of classic statistical methods in natural sciences. Examples will primarily derive from ecology, paleobiology, and geological sciences. Lab sessions will provide practical training in using R for data processing and analyses. The course will consist of self-contained modules built around empirical examples. Although some of the topics are inherently biological, many aspects of the course should be transferable to other disciplines of natural sciences. This course will provide intuitive (rather than mathematical) introduction to common methods used in natural sciences to analyze empirical and experimental data. The course will NOT cover phylogenetic methods.

Topical Overview

Segment	Content
S1: Introductory Materials	Data, variables, data reporting, data transformations and standardization, univariate descriptors, hypothesis testing
S2: Interactions between Two Variables	Bivariate plots, covariance, correlation, partial correlation, and type I and type II linear regression
S3: Ordinations: Exploring multivariate data in natural sciences	Exploratory methods: PCA, PCO, nMDS, CA, DCA, CCA, CVA Confirmatory methods: MANOVA, MANCOVA, Permutation tests, Classificatory methods, Discriminant functions
S4: Measuring diversity	Diversity indices, RAD models, alpha-beta-gamma, sampling standardization methods (rarefaction, Jackknife, shareholder quorum, etc.), disparity, functional diversity
S5: Resampling strategies in natural sciences	Randomization, bootstrap, jackknife, subsampling, Monte Carlo models
S6: Additional Topics	Additional topics may be covered time permitting

Grading: Grades will be based on mandatory assignments. Students who satisfactorily complete all assignments by due dates will receive A. Grades lower than A may result from missed, overdue, or incomplete assignments.