**COURSE TITLE: INTRODUCTION TO LINEAR MODELS**

**COURSE NUMBER: BIOL-861 Winter 2023**

**CO-ORDINATOR: W. Nelson**

**OUTLINE OF TOPICS:**

This is a course designed to introduce students the linear model for analyzing continuous and categorical data in biology. Each session will begin with a short lecture by the faculty instructor, followed by a student presentation of homework, and a hands-on interactive session using the open source R software environment for statistical computing and graphics. Each student will bring a laptop to class.

**METHOD OF INSTRUCTION:**

Students taking this course will develop skills in using R for analyzing and graphing biological data in a linear model frame-work. Emphasis will be placed on multiple regression techniques and real biological problems. Students will learn how to fit models, how to assess model assumptions, and how to plot results to be maximally informative.

This course requires a basic understanding of both statistics and R, as taught in BIOL-860

**Sessions (12 sessions)**

Lecture topics:

1. Linear model structure
2. Using lm for multiple regression
3. Testing assumptions
4. Analyzing residuals
5. Transformations
6. Nonlinear regressions
7. Model selection: stepwise procedures
8. Model selection: information-theoretic approaches
9. Fitting categorical data
10. OLS vs RMA regression models
11. Partial regression analysis
12. Repeated measures designs

**Session Structure (90 minutes lecture plus workshop):**

Workshops would consist of student presentation of homework assignments and practical experience applying statistical techniques in R. A typical session will involve a short lecture by the faculty instructor, followed by a student presentation of the assigned homework, and a group-learning exercise to analyze data using the R statistical program.

**EVALUATION**:

Participation: 20%

Homework assignments: 80% (16% each)

**RECOMMENDED TEXTS AND REFERENCE MATERIAL:**

**PREREQUISITE AND ASSUMED BACKGROUND**:

Biol-860 Introduction to Statistics with R, or equivalent. Students must have a working knowledge of basic statistical analysis using R.

**ENROLMENT**: 10 MSc students per year plus 5 PhD students, postdocs and/or faculty