# Department of Statistics

# UCLA

# Statistics 101B

**Tentative List of Topics Covered in this Class:**

- Ideas and applications of experimental design (overview)
- Randomization, replication, blocking
- Guidelines for designing experiments
- Fixed effects vs random effects
- Experiments with a Single Factor
    - The Analysis of Variance (ANOVA) – One-way ANOVA
    - Means model vs Effects model
    - Multiple comparisons (Tukey)
    - Sample size determination, Power
- Experiments with More than One Factor
    - Randomized complete block design
    - Latin square design
    - Graeco-Latin square design
    - Balanced incomplete block design
    - Two-way ANOVA
    - Nuisance factors, random assignment, blocking
    - Multiple comparisons (Tukey, Bonferroni, … etc.)
- Factorial Designs
    - Factor levels, main effects, interaction effect
    - Regression model representation
    - Response surface, contour plot
    - Interaction plots
    - Sample size determination

    - $2^k$ factorial design
    - Blocking and confounding
    - Two-level fractional factorial designs
- Experiments with Random Effects
    - ANOVA for the random model
    - Variance components
- Two-Stage Nested Design
- Split-Plot Design

**End-of-course Objectives:**

- Study background of a context in mind and formulate a research question(s)
- Setup an experiment and choose the appropriate design based on the objectives and research questions.
- Determine the sample size needed to the experiment under consideration. Calculate the power of statistical tests conducted.
- Conduct the experiment and collect the data
- Statistical analysis and interpretation of the results of the experiment using tools such as the ANOVA table and main effects and/or interaction plots

**List of Requisite Skills**:

General idea of regression models taught in STAT 101A, R coding skills, G-Power software (Later), basic statistics taught in Stat 10 (variance, mean, etc.)