Exam 2 Information

The exam will be given on canvas.  It will be closed notes, closed book. The exam will be timed.  It will be a mix of short answer and conceptual questions.

While this exam is not focused on material from modules 1-3 it is necessary that you understand those concepts in order to understand the concepts on this exam.

**Module 4 – will be majority of exam**

* Know how to recognize factors as blocking factors.
* Know how to include a blocking factor in an analysis for a continuous factor.
* Understand the special structure of a Latin Squares Design.
* Understand how to analyze a replicated Latin Squares Design.
* Understand the model fit to each of a CRD, RCBD, LSD and GCBD.
* Know when to use each different type of experiment.
* Know how to analyze a RCBD when there are replicates between the blocks.
* Know how to include a blocking factor in an analysis with a binary factor.
* Understand why the analysis of a blocking factor should not be subject to statistical testing.
* Be able to construct a completely randomized block design (RCBD) plan for a blocked experiment with one factor.
* Be able to construct an LSD plan for a blocked experiment with two blocking factors.
* **Know how to calculate the degrees of freedom for a blocked experiment**.
  + **# of levels** – 1
  + **Treatments and blocks** ??

**Module 5**

* Understand the mechanics of paired testing and when to use it.
* Understand what pairing experimental units does to the variance.
* Be able to describe covariate imbalance and know why it is a problem.
* Understand why **blocking will not solve covariate imbalance.**
  + **Covariate imbalance matching.Rmd (Blocking)**
* Understand why randomization might not solve this problem and how to use re-randomization
* Understand how to use propensity matching and the concept of optimal matching
* Be able to discuss the advantages and disadvantages of between-subject vs. with-in subject testing.
* Understand the mechanics of propensity score matching.
  + Technique

**Experiment Fun!**

* **Understand what it means to randomize across multiple replicates vs. using blocks to create replicates**
  + In experiment, no blocking
  + Correct way to randomize was to take all 20 helicopters and drop in a random order
* Understand the difference in analysis between the two situations above.
* **Understand the best method to obtain an estimate for sigma for a power analysis.**

**Logistic Regression**

* **The three reasons we can’t use multiple linear regression to fit a model with a binary response and why. You should be able to explain these.**
* The basic operation of manipulating the probabilities to get a continuous number (just know we use the logit transform).
* Understand the relationship between the logit (p) and the logistic regression coefficients.
* Understand the relationship between P(y=1) and the logistic regression coefficients.
* How to interpret (simple and multiple logistic regression model) coefficients
* **How to calculate predicted probabilities from the logistic model.**
  + Practice in example
* How the logistic regression coefficients are computed and a little about the method of maximum likelihood
* How to evaluate the logistic regression model as an explanatory model.

**Complete practice assignment**

* Do not interpret coefficients in terms of log(odds)
  + Must do it in terms of odds

**Module 6**

* Be able to explain the advantages of using a factorial plan vs. one-factor-at-a-time when you have multiple factors to study.
* Be able to create a factorial design plan with any number of factors.
* Be able to interpret/assess interactions in a factorial design.
* Understand the analysis of a factorial design (ANOVA, interaction plots, assumptions)
* Be able to analyze a factorial experiment when the response is a proportion and when the response is continuous using the chi-square test.

**In-class assignment**

**Important Stuff**

* Be able to state what kind of design an experiment should be
* Can you pick the right design out of two options