The purpose of this project is to give you the experience of designing, conducting and analyzing data from an experiment. You should do this as a group project. The topic for the project is basically up to your group. There are some possible topics listed on the next page but your group is free to choose your own topic. Your group must have your topic choice approved by Dr. Bob. Experiments involving human subjects are usually subject to IRB rules and may not be appropriate for this assignment. The experiment itself must have:

- At least two factors of interest. In addition to the effects of these factors you must also investigate interaction between the two factors.
- At least 8 treatment combinations in your experiment.
- Randomization. You may run the experiment as a completely randomized design, a randomized complete block design, a randomized Latin square design or a split plot/repeated measures design. The design you choose should take into account the material you are using and any nuisance factors.
- Replication within the experiment. You should plan to have enough replication so that differences in factor level means between 1 and 2 standard deviations can be detected.
- Control of outside variables. You should control outside variables as appropriate.

Your final report should include the following:

- **Description of the Experiment:** Indicate response, conditions, treatment combinations, any nuisance factors and experimental material. Describe in detail how the experiment was conducted. Be sure to specifically indicate how randomization was included in the design. It is not sufficient to simply say we randomized. You must completely describe how you randomized. Be sure to record the randomized order of the runs.
- **Analysis of data:** Do NOT include raw computer output. You can “cut and paste” the appropriate graphs and output into the body of your report. Include only those plots and output that are relevant to your analysis. If you include extraneous output you will lose points for the analysis.
- **Summary and Conclusions**
- **Appendix:** List all the data collected including the responses, factor levels, treatment combinations and run order. A copy of the JMP data table is fine.

ONE report is to be submitted by each group. Reports will NOT be returned. It is the group’s responsibility to make copies for its members. Write the report so that someone with little or no knowledge of statistical jargon can understand it. An important part of statistics and experimentation is being able to communicate results effectively. Each team member should submit a sealed envelope with the names of all group members and an assessment of the % contribution to the project. If no envelopes are turned in, I will assume everyone contributed equally.

Your project will be graded based on the following criteria:

- Design and running of the experiment (30)
- Appropriateness and correctness of analysis (30)
- Appropriateness of conclusions and generalizations (5)
- Following guidelines (10)

Each student in a group will receive a critique of the project. Each student in a group will also receive a score based on the grading criteria and his/her participation in the project.

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1 If you wish to do an individual project, please talk to Dr. Bob about this possibility.
Time table

You may submit work anytime on or before the listed dates. Submissions after the dates listed below will result in deductions from your project score. If you submit something to me via email, be sure it lists all of the members of the group and that each group member is copied on the email.

- **April 2:** Groups formed and topic chosen. Each group should submit a list of the names of group members and the topic chosen. Indicate the response variable, conditions, and experimental material. Comments on project proposals will be returned the next class period. Do not start on your project until you get approval from Dr. Bob.

- **April 9:** Groups submit details of the experiment. What factors will be manipulated? What levels are there for each factor? What design will be used? How much replication will you have? How will you use randomization? A data collection template should be turned in at this time indicating the randomized order of your runs. This can be a hard copy of a JMP data table. Comments on project details will be returned in class on April 11.

- **April 23:** Data collection completed. A copy of the data must be submitted and no changes to the data can be made after submission. You should email (wrstephe@iastate.edu) the data in the form of a JMP data file.

- **May 2:** Final report due. Each group should submit only one report that includes all group members’ names. Reports will NOT be returned. Each individual in a group will receive a critique of the project and a project score.

Project Ideas

Listed below are some possible topics for investigation. You are also free to choose your own topic but it cannot be a topic that we have discussed in class e.g. an experiment with popcorn. All topics require you to actually design and conduct an experiment. Whether you come up with your own topic to investigate or use one of the topics below, you must check with Dr. Bob before you proceed. Experiments involving human subjects are subject to certain restrictions. Getting approval can take a long time and so an experiment involving human subjects is usually not appropriate for this assignment.

- Quality of paper towels, toilet paper, tissues, etc.
- Quality of batteries.
- Flight of paper airplanes or helicopters.
- Quality of glue.
- Roll, rebound or other characteristic of a tennis ball.
- A topic of your choosing. If you are collecting data as part of a research study separate from this class you may use that data for this assignment. The research study must have an experimental design that meets the criteria set out earlier.