STAT 321: Industrial Design of Experiments I

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Office Hours: [Link](http://course1.winona.edu/cmalone/schedule.htm)

**Optional Text**: *Design and Analysis of Experiments* by Douglas C. Montgomery (7th Edition)

**Course Description:** STAT 321 is an introduction to applications of statistical methods used by industrial researchers to aid in the solution of certain types of industrial problems.

**Prerequisites:** An introductory statistics course (preferably STAT 303 OR STAT 210).

**Learning Outcomes:** A student who has successfully completed this course will be able to:

1. **Correctly design an experiment applying the concepts of control, replication, and randomization.**

After successfully completing this course, you will be able to decide what type of design is appropriate for a given study. In addition, you will be able develop a well-designed experiment to address industrial problems.

1. **Select appropriate statistical techniques for analysis of results.**

You will encounter several real-world experiments in this class, and you will be required to discuss the design of the experiment in detail and carry out an appropriate analysis. Moreover, you will be asked to distinguish well-designed experiments from poorly designed studies.

1. **Record, process, and critically analyze experimental data using statistical software.**We will be using Minitab almost exclusively for data analysis. We will utilize software during class, and you will be required to use statistical software on all homework assignments and take-home exams.
2. **Report and communicate conclusions effectively, and present findings in formats suitable for communicating to technical audiences.**

After successfully completing this course, you will be able to communicate the essential features of the data in a clear and concise manner. You will be required to provide appropriate interpretations and conclusions of experiments on almost all problems in class, on homework, and on exams.

**Assessment Methods**

* Homework assignments will be given throughout the semester.  I will collect your homework assignments. I strongly encourage you to stay current in your homework assignments.  Late homework assignments will be assessed a 10% penalty for being late and will not be accepted after graded assignments are returned. Working in groups of two on homework assignments is allowed and encouraged.
* There will be one midterm exam and one final exam for this course. I will test your ability to make conclusions and/or extensions to current methods.  More than likely these exams will consist of an in-class portion and an out-of-class portion. If you know you are going to miss an exam, the exam *must* be taken early. Makeup exams will not be given.

**Grades**:

Your grade will be determined by your performance on exams, quizzes, homework.  My “target” for the number of points is two exams = 200pts and homework/quizzes = 200pts.  I do no weighting, so a point is worth a point in this class.  Your final grade will be determined using the following percentages.

|  |  |
| --- | --- |
| Your Percentage | Grade |
| greater than 90%    | A |
| 80% - 90% | B |
| 70% - 80% | C |
| 60% - 70% | D |
| less than 60% | F |

**Academic Integrity Policy**The WSU Undergraduate Catalog contains a full listing of policies and procedures pertaining WSU’s Academic Integrity Policy. Note that both copying another student’s work and allowing someone to copy your work are clear violations of our academic integrity policy. If there is reasonable evidence of copying another individual’s or group’s work, it will be construed as an act of plagiarism. The first occurrence of cheating will result in a score of zero on that specific homework assignment or exam portion; the second occurrence may result in failure of the course.

**Computing**

We will Minitab extensively in this class. This software package is available from the WSU network. Unfortunately, this software only runs on a Windows operating system.

**Extras**

* I encourage you to use a 3-ring binder for this class because class material will be a combination of note taking, handouts, and lots of computer output.
* Attendance in mandatory.  If you miss class, it is your responsibility to get the material and get yourself caught up.
* If necessary, I reserve the right to make policy changes for this course as the semester progresses.

**Course Outline**

The following is a *tentative*schedule. If needed, some topics may be omitted, and the course may include additional topics if time allows.

1. Introduction to Design of Experiments
2. Review of Simple Comparative Experiments
3. Single Factor Experiments
	1. ANOVA
	2. Model Checking
	3. Multiple Comparison Procedures and Contrasts
	4. Regression Approach
	5. Kruskal-Wallis and Rank Transformations
	6. ANCOVA
4. Randomized Blocks and Related Designs
5. Introduction to Factorial Designs
6. 2k Factorial Designs
7. Blocking and Confounding in the 2k Design
8. Fractional Factorial Designs
9. Factorial Designs with Random Effects
10. Nested Designs

Other topics may include (time permitting): 3k Designs, Taguchi Designs, or Response Surface Methods