**ME 430 Senior Laboratory**

Catalog Data:

Detailed lab investigation of engineering problem; statistical design of experiments; application of engineering principles to analyze experimental data; technical report writing; oral communication skills. Prereq: ME 313, 330; coreq: Engl 317.

Textbook: None

Meeting Times: Tuesday, Thursday

12:30 – 1:45 TLC 222

Course Web Page: http://www.webpages.uidaho.edu/mindworks/experiment\_design.htm

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| Instructor: | Dan Cordon |
| Office: | GJ 234H |
| Phone: | (208) 885-7134 |
| Email: | dcordon@uidaho.edu |
| Office Hours: | TBD |

**Prerequisites Topics:**

1. Familiarity with statistical terminology such as: mean, median, standard deviation, normal distribution, accuracy, and precision.
2. Able to use basic math-modeling software (Excel, MathCAD, Matlab, etc.).
3. Capability to take derivatives and integrals of simple functions.
4. Use look-up tables to find statistical values
5. Professional documentation practices (homework, notebook, reporting, etc.).

ME430 is a project course. It is intended to be an introduction to the type of engineering experimentation and group problem solving practiced in industry. During the course of the semester you will work in teams of ~3 people to design, conduct, and report on your experiment. Homework assignments will be graded individually (although collaborating with others is always encouraged), while lab notebooks and reports will be graded as a team.

**Course Outcomes:**

* Use of professional-level documentation skills.
* Use proper technical writing skills to create a research proposal, and a scientific-grade final report.
* Formulation of practical objectives and relevant hypothesis regarding an engineering problem.
* Planning a controlled experiment in which alternative design ideas and theories can be isolated and measured. Provide analysis for error on your measurements.
* Meaningful selection and proper use of equipment necessary for the experiment you will be performing.
* Critically evaluating and refining an experimental procedure.
* Proposing conclusions and recommendation based on laboratory findings.
* Communicating to other engineers the purpose of your project, the methodology selected to obtain experimental data, and the implications of your findings.

**Professional Behaviors:**

* Understand the assumptions surrounding the use of a statistical model before applying an equation.
* Uses engineering intuition and/or alternative solution methods to validate calculations.
* Uses teaming to solve difficult problems or to add value/robustness to a solution.
* Questions any statistical claim made in advertisements.
* Maintains a design notebook containing relevant discoveries, meeting notes, data, and results.
* Identifies potential resources that are available to aid in experimental setup.

**Course Activities:**

**Statistics Section**

* Your previous lab courses have focused on large-sample statistics, ME430 will focus primarily on small-sample statistics.
* Early in the course there will be frequent lectures, in-class activities, and homework assignments – all related to small-sample statistics.
* There will be an ABET statistics exam, covering all the statistics topics covered in this, and previous lab courses.
* There will also be a factorial design experiment done in a lab.

**Experiment Design Section**

Around week 5 there will be a project proposal due which will be used to assemble teams for the various projects. By week 6 you will be working in teams doing exercises to help prepare your experimental design. After week 6 there will be few in-class lectures, but will use class time to have team meetings with each team. Teams will document their work in a team notebook, which will be used during team meetings. Each team will compile a final report detailing the project background, experimental design, data, and findings.

**Learning Skills:** \*\* Indicates high priority skills for this course

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| --- | --- |
| **Cognitive:**   * Inquiring * Measuring * Experimenting * \*\*Thinking skeptically * Diagramming * Benchmarking * Defining the problem * Identifying issues * Identifying constraints * Establishing requirements * Selecting tools * \*\*Locating relevant literature * Stating research questions * \*\*Designing experiments * \*\*Selecting methods * \*\*Extracting results * \*\*Replicating results | **Social:**   * \*\*Organizing a message * \*\*Collaborating * Sharing knowledge * Persuading * Being non-judgmental * \*\*Defining team roles * Confronting poor performance * \*\*Securing resources   **Affective:**   * \*\*Preparing * \*\*Being proactive * Persisting * Accepting help * Seeking assessment * Accepting outcomes |

**Course Grading:**

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| --- | --- | --- |
| ***Category*** | ***Assignment*** | ***% grade*** |
| Experiment Design Exercises | Uncertainty Homework | 10 |
|  | Statistics Homework | 10 |
|  | Regression Homework | 10 |
|  | Factorial Experiment Lab | 10 |
|  | Statistics Exam | 10 |
| Laboratory Notebooks | Periodic Inspection | 10 |
| Technical Writing | Written Proposal | 5 |
|  | Final Report | 35 |

**Course Letter Grades:**

90-100 A

85-90 B

80-85 C

70-80 D

Below 70 F

**Homework:**

As seniors, you need to demonstrate that you understand course material at a competent level. There are very few homework assignments in this class, but the expectation is that you will do them at a 100% level. This means proper engineering documentation that leads to a complete, correct solution. To ensure this happens, you won’t be given credit for a homework assignment that isn’t complete and correct.

If you earn a 90-100% on the assignment, that is the score you will get. If you would have earned less than a 90%, you will get a “Resubmit” note on your homework. You will have one week to resubmit your homework.

* The max score for a first resubmit is 80%
* The max score for a second resubmit is 70%