ESM 422/622 Engineering Decisions

Tentative Spring 2017 Course Syllabus (updated January 17, 2017)

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Lectures	3:40pm –5:10pm, Tues/Thur, Duckering 341
Office Hours	2:30pm – 3:30pm, Tues/Thur, Duckering 245D or by appointment via email (time and location TBD)
Catalog Data	ESM 422, CRN 33205
Course Title	Engineering Decisions
Prerequisites	CE junior standing or permission of instructor
Course Description and Topics	Risk and uncertainty in engineering decisions. Basic applied probability and statistics, data analysis, regression analysis and time series. Practical applications of decision tools: linear programming, inventory analysis, queuing, network models and utility theory. Engineering judgment and uncertainty.
Credit	3.00 semester hours
Textbook, Readings, etc.	Montgomery, D.C., Runger, G.C., & Hubele, N.F. (2010). *Engineering Statistics– 5th Edition. John Wiley & Sons, Inc.* **NOTE:** *Earlier editions of this textbook may be available, but differences in the content and assignment of questions may exist.* ***Students are responsible for the material and content in the 5th edition.*** Supplementary readings and notes will be distributed as needed. Coursework will require the use of JMP, a statistical analysis software package freely available through the UAF Software website. If you are comfortable with another program, you are welcomed to use it but support may not be as comprehensive.
Course Objectives	This course is designed to: introduce to engineering statistics and how statistical tools are integrated into the engineering problem-solving process; demonstrate the process of designing and analyzing engineering experiments; present descriptive statistics, probability and probability distributions, statistical test and confidence intervals for one and two samples, and building regression models; understand the basic tools and methods for testing hypotheses; learn how to effectively present data and statistical findings.

ABET Program Outcomes

This course will help students achieve the following:

(a) an ability to apply knowledge of mathematics, science, and engineering;
(e) an ability to identify, formulate, and solve engineering problems;
(f) an understanding of professional and ethical responsibility;
(g) an ability to communicate effectively;
(j) a knowledge of contemporary issues; and
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Communication

Outside of scheduled lectures & office hours, email is the official form of communication. Students are expected to check their UAF email accounts for course updates. In addition, UAF Blackboard will be used for general announcements and distribution of course materials as necessary.

Homework

Homework is to be handed in at the beginning of class on the scheduled due date. Homework assignments can be done collaboratively, but it is expected that each student will turn in his/her own copy of the assignment. Blatant copying of another student's work will not be tolerated. Homework solutions will be discussed during review sessions or class as necessary. Homework will still be accepted at the beginning of the next scheduled class but will be penalized 50%; after the next scheduled class homework will no longer be accepted. Homework will also not be accepted if they are not stapled. Homework will not be graded and considered late if there is no name on it. Problems for which answers are not circled or clearly marked will be marked as wrong.

Term Projects

Two projects will be assigned involving the application of methods presented in class: first project will be done individually; second project will be done in small groups. More specific project descriptions will be provided and discussed once sufficient material has been covered in the lectures.

Quizzes and Exams

For in-class quizzes and exams, students are responsible for their own writing utensils and calculators. Devices that solely designed for communication purposes (e.g., cell phones) are strictly prohibited. Other devices with computing or note taking capabilities (e.g., laptops, IPads, etc.) are permitted only if permission of the instructor has been obtained prior to the day of the exam. This device must be in "airplane mode" or similar during exams. Two exams will be given during the semester (mid-term and final). Exams may consist of two parts: 1) closed-book/notes; and 2) open-book/notes. Mobile or electronic devices (other than a calculator) are not permitted for use during exams. Quizzes will *always* be closed book and closed notes. Only writing utensil, calculator, references, scrap paper, and exam will be allowed on the desk during the exam. The final exam will be comprehensive and encompass material from the entire semester, although emphasis may rest heavily on the second half of the course.

Grading

20% Homework (7)	*A*	*90-100%*
30% Projects (2 @ 15% each)	*B*	*80-89%*
20% Mid-Term Exam	*C*	*70-79%*
20% Final Exam	*D*	*60-69%*
10% Quizzes (TBD)	*F*	*0-59%*

Attendance

Although class attendance is not mandatory, multiple absences will affect your performance and ultimately affect your grade. Students who are unable to attend class should, if possible, notify the instructor in advance and plan to make up or obtain the material from fellow classmates. "I have a structures exam this afternoon" is not a legitimate excuse for missing class. There will be no opportunities to make up missed quizzes. If one is unable to take a test due to an absence, a makeup opportunity will be given only under special circumstances. These circumstances include: 1) illness or personal injury, 2) university-related extracurricular activities, and 3) legitimate extenuating circumstances. Illnesses and personal injuries include those suffered by the student or a student's spouse or children. Non-illness or injury related reasons must be discussed with the instructor in advance of the scheduled test.

Mobile Devices

The use of mobile devices in the classroom will be strictly prohibited. If you are using your cell phone or your cell phone goes off during class, you will be asked to leave. The use of laptops for note taking will be permitted. However, if it is clear that you are using it for anything other than course related activities you will be asked to leave.

Academic Integrity

Students are expected to and should strictly comply with UAF's Student Code of Conduct. Offenses against the Code of Academic Integrity and Student Code of Conduct are deemed serious and insult the integrity of the entire academic community. Any suspected violations of the code are taken very seriously. Further university policies addressing plagiarism, fabrication, collusion, and cheating can be found on pp. 50-52 in Academics and Regulations. Any student found violating these codes will be given an automatic failing grade for that assignment. More than one violation will result in a failing grade for the course and will involve disciplinary action.

Disabilities Services

If you have a formal accommodation plan developed in conjunction with the UAF Center for Health and Counseling office please contact me as soon as possible at the start of the semester. If you would like to learn more about your options, these services, or discuss the supports that you need in order to learn well in this class, please contact the coordinator of Disability Services at 474-7043.

Support Services

The UAF Writing Center (located in 801 Gruening) is staffed with English Department teaching assistants and undergraduate students that can assist you in all phases of the writing process. Students are encouraged to take advantage of these services when preparing their project reports. In addition, the UAF Math Lab offers advice, tutoring, and assistance for classes involving mathematics and statistics.

Tentative Spring 2017 Schedule

WEEK	MON	TUES	WED	THURS	FRI	SAT/SUN	MONTH
1	16 Holiday	17 Syllabus/Introduction, Engineering Method and Statistical Thinking	18	19 (MR&H Chap. 1) Collecting Data, Models, Processes Over Time HW 1 Assigned	20	21/22	JAN
2	23	24 (MR&H Chap 2.1-2.3) Data Summary & Pres. Pt.1	25	26 (MR&H Chap 2.4-2.6) Data Summary & Pres. Pt.2 **HW 1 Due***	27	28/29	
3	30	31 (MR&H Chap 3.1-3.4) Random Variables HW 2 Assigned	1	2 (MR&H Chap 3.5-3.7) Continuous Distributions	3	4/5	FEB
4	6	7 (MR&H Chap 3.8-3.11) Other Distributions and Normal Approximations **HW 2 Due***	8	9 (MR&H Chap 3.12-3.13) Random Functions, Independence, Samples, and CLT HW 3 Assigned	10	11/12	
5	13	14 (MR&H Chap 4.1-4.3) Single Sample: Hypothesis Testing Project 1 Assigned	15	16 (MR&H Chap 4.4-4.5) Single Sample: Inference on the Mean **HW 3 Due***	17	18/19	
6	20	21 (MR&H Chap 4.6-4.10) Single Sample: Inference on Variance and Proportion HW 4 Assigned	22	23 Single Sample: Real-World Data	24	25/26	
7	27	28 *Project 1 Work* **HW 4 Due***	1	2 *Project 1 Work*	3	4/5	MAR
8	6	7 *EXAM REVIEW* **Project 1 Due***	8	9 **EXAM 1**	10	11/12	
9	13	14 SPRING RECESS	15	16 SPRING RECESS	17	18/19	
10	20	21(MR&H Chap 5.1-5.3) Two Samples: Variance Known and Unknown	22	23(MR&H Chap 5.4-5.5) Paired t-Test and Ratio of Variances HW 5 Assigned	24	25/26	
11	27	28 (MR&H Chap 5.6-5.8) Two Population Proportions & >2 Samples Project 2 Assigned	29	30 (MR&H Chap 6.1-6.2) Linear Regression **HW 5 Due***	31	1/2	APR
12	3	4 (MR&H Chap 6.3-6.4) Multiple Regression HW 6 Assigned	5	6 (MR&H Chap 7.1-7.3) Factorial Experiments and Design	7	8/9	
13	10	11 (MR&H Chap 7.4-7.6) Center Points and Replication in 2^k Design **HW 6 Due***	12	13 (MR&H Chap 7.7) n^k Experiments HW 7 Assigned	14	15/16	
14	17	18 *Project 2 Work*	19	20 *Project 2 Work* **HW 7 Due***	21 Springfest	22/23	
15	24	25 **Project Presentations** **PROJECT 2 Report Due***	26	27 **Project Presentations**	28	29/30	
16	1	2 *EXAM REVIEW*	3	4 **Final Exam (3:15-5:15pm)**	5	6/7	MAY

Notes: () Information inside brackets are required readings expected to be completed prior to class on that day
* All assignments and projects are to be handed in at the beginning of class on the listed date.