CONCORDIA UNIVERSITY
DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Syllabus and General Information

ENGR 371 **Probability and Statistics** January 2017

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Course Objective:
This is an introductory course in probability and statistics. It aims at teaching engineering students the fundamentals of the probability and statistics theory with applications to various engineering disciplines. Many examples related to real life engineering (probabilistic) problems will be addressed.

Instructors:

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Office Hours: Monday 15:00 - 16:00 & Thursday 10:30 – 11:30

Sections:

Section T, H-531, Tuesdays and Thursdays 14:45 - 16:00

Section UU, H-531, Fridays 17:45-20:15

Section W, FG C080, Wednesdays and Fridays 10:15 - 11:30

Pre-req.: ENGR 213 and ENGR 233

Textbook:
Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, 6th Edition, Wiley 2014.

References:
Any text on probability and/or statistics can serve as a reference. There is a large number of them available at the Concordia University Library.

Topics:
- Introduction (Chapter 1)
- Probability (Chapter 2)
- Discrete random variables and probability distributions (Chapter 3)
- Continuous random variables and probability distributions (Chapter 4, excluding 4.9-4.12)
- Joint probability distributions (Chapters 5, excluding 5.5,5.6)
- Descriptive Statistics (Chapter 6, 6.1 and 6.7 only)
- Sampling distributions (Chapter 7, excluding 7.3.4, 7.4)
- Statistical Intervals (Chapter 8, excluding 8.4, 8.6)
- Tests of Hypotheses (Chapter 9, 9.1-9.4 only)

Course Schedule (Tentative) – Section W:

Date	**Topic**	**Suggested Problems**
Week 1 Ch. 2.1-2.4 Jan 11 & 13	Sample Spaces, Events, Counting, Axioms of Probability, Addition rules, conditional probability.	2.15, 2.27, 2.66, 2.70, 2.87, 2.89, 2.92, 2.103, 2.107, 2.114
Week 2 Ch. 2.5-2.8 Jan 18 & 20	Multiplication rule, Total Probability Rule, Independence of events, Bayes Theorem, Random Variables.	2.153, 2.156, 2.169, 2.171, 2.175, 2.182, 2.221, 2.227
Week 3 Ch. 3.1-3.6 Jan 25 & 27	Discrete Random Variables, pmf's, cdf's, Mean and Variance for discrete random variables, discrete uniform distribution, binomial distribution.	**Quiz 1** 3.10, 3.27, 3.32, 3.47, 3.52, 3.66, 3.68, 3.86, 3.91, 3.92, 3.110
Week 4 Ch. 3.7-3.9, 4.1-4.2 Feb 1 & 3	Geometric distribution, negative binomial distribution, hypergeometric distribution, Poisson Distribution, Continuous Random Variables, pdf's.	3.125, 3.131, 3.149, 3.165, 3.185, 3.187, 3.201, 3.202, 4.4, 4.7
Week 5 Ch. 4.3-4.8 Feb 8 & 10	cdf's, Mean and Variance of Continuous random variables, continuous uniform distribution, normal distribution, normal approximation for binomial and poisson distributions, exponential distribution.	**Quiz 2** 4.18, 4.26, 4.49, 4.55, 4.67, 4.73, 4.100, 4.124, 4.139, 4.146
Week 6 Ch 5.1-5.2 Feb 15 & 17	Bivariate and multivariate distributions, Joint distributions, marginal distributions, conditional distributions, independence of two random variables, covariance and correlation**.**	**Quiz 3** 5.1, 5.3, 5.9, 5.14, 5.16, 5.20, 5.23, 5.27, 5.34, 5.42
Week 7 Mar 1 & 3	There is a lecture on March 1 **Midterm on Friday, March 3, 2017, 10:15-11:30AM**	
Week 8 Ch 5.3-5.4 Mar 8 & 10	Common Joint Distributions: multinomial distribution, bivariate normal distribution. Linear functions of random variables.	5.48, 5.49, 5.52, 5.54, 5.55, 5.62, 5.67, 5.70, 5.71, 5.78
Week 9 Ch 6.1,6.7, 7.1-7.3 (excluding 7.3.4) Mar 15 & 17	Numerical summaries of data, Probability plots. Point estimation, Sampling distributions, Central Limit Theorem, Unbiased estimators, variance of a point estimator, mean squared error.	**Quiz 4** 6.12, 6.16, 7.4, 7.11, 7.12, 7.13, 7.14, 7.24, 7.29, 7.34
Week 10 Ch 8.1-8.3,8.5 Mar 22 & 24	Confidence Intervals on the mean of a normal distribution both with variance known and unknown. Confidence intervals on the variance and on the standard deviation. Guidelines for confidence intervals.	**Quiz 5** 8.1, 8.8, 8.10, 8.14, 8.17, 8.21, 8.31, 8.38, 8.52, 8.54
Week 11 Ch 8.7, 9.1 Mar 29 & 31	Tolerance and prediction intervals. Hypothesis Testing.	9.1, 9.3, 9.10, 9.15, 9.17, 9.20, 9.21, 9.25
Week 12 Ch 9.2-9.4 Apr 5 & 7	Tests on the mean of a normal distribution both with variance known and unknown. Tests on the variance and standard deviation of a normal distribution.	**Quiz 6** 9.36, 9.40, 9.43, 9.48, 9.52, 9.58, 9.62, 9.65, 9.80, 9.83
Week 13 Apr 12 & 18	Review	

Tutorial Sessions (all sections):
TA: Fridays 10:15AM - 11:05AM, H 540
TB: Fridays 10:15AM - 11:05AM, H 537
TC: Fridays 10:15AM - 11:05AM, H 564
UUA: Fridays 2:45PM - 3:35PM, H 537
UUB: Mondays 2:45PM - 3:35PM, H 537
UUC: Mondays 2:45PM - 3:35PM, H 564
WA: Wednesdays 8:45AM - 9:35AM, H 562
WB: Fridays 8:45AM - 9:35AM, H 564
WC: Fridays 8:45AM - 9:35AM, H 562

Skills and attributes:
All engineers must be able to analyze data and draw valid conclusions from it. Many of the tools that you learn in this course will be aimed toward that. This course emphasizes and develops the following CEAB (Canadian Engineering Accreditation Board) graduate attributes and indicators:

Attribute	Indicator	Level of knowledge	Evaluation method
Investigation	Background and Hypothesis Formulation	Introductory	Group project
	Designing Experiments	Introductory	Group project
	Conducting Experiments and Collection of Data	Intermediate	Group project
	Analysis and Interpretation of Data	Intermediate	Group project
A knowledge base for engineering	Knowledge-base of mathematics	Advanced	Assignment/project/exams
	Knowledge base in a specific domain	Advanced	Assignment/project/exams

Exams:
One midterm and one final exam will be given. All exams will be closed book. If you miss the midterm exam for any reason, the weight on the midterm will be added to that of the final exam. The crib sheets will be provided.

Assignments:
One of the most important skills that you can have as an engineer is the ability to read a technical document and get something out of it. One of the best techniques to get more out of what you read is to make notes and formulate questions and hypothesis as you read. This takes often passive activity of reading and makes it active. Before the first class of each week you should have read the sections in the textbook for the upcoming week. You should turn in:

1. Three pages of "jottings". This is original handwritten material concerning the material you have read. Jottings can take any form, for example: summary, questions that occurred to you, insights, etc.

2. Three sentences that summarize what you've read.

Two things will be done: we check that you did the jottings (no photocopies!!) and give you a mark on your three sentences. We will do this for Weeks 2 through 12, but not in Week 7. This means there will be 10 such assignments. The best 8 of these assignments will be used for 5% of your grade.

Quizzes:
Six quizzes will be given and the best five will be counted. The questions on the quizzes will be related to the suggested problems. Your best five quizzes will be used for 10% of your grade. The quizzes will take place in the class on Fridays.

Project:
The project will be a team project (not more than three students per group). This will count for 15% of your grade.

Grading:

Scheme A

Assignments	5%
Project	15%
Quizzes:	10%
Midterm:	20%
Final exam:	50%

Or

Scheme B

Assignments	5%
Project	15%
Quizzes:	10%
Final exam:	70%

Whichever is better.
If you miss the midterm for any reason scheme B will be used.

Academic Code of Conduct:

- All students are expected to fully respect the academic honor system and abide by the Code of Academic Conduct set by Concordia University.
- Any reasonable suspicion of an honor violation will be reported.