CONCORDIA UNIVERSITY
DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

Syllabus and General Information

| ENGR 371 | **Probability and Statistics** | Jan. 2020 |

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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:

Course Instructor: Professor Hassan Rivaz, Section T
Email: hrivaz AT ece.concordia.ca
POD: Mr. sobhan Goudarzi <sobhan.goudarzi@yahoo.com> **Thursdays 1 PM to 2 PM and Thursdays 4:30PM to 6:30PM**, from week 5 (Feb 4) to week 13 (Apr 8) at EV 10.245
Office Hours by Dr. Rivaz: Thursdays 10:30AM to 11:30AM at EV5.235, every week

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)

Date	Topic	Suggested Problems
Week 1 (Jan 7) Ch. 2.1-2.4	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 (Jan 14) Ch. 2.5-2.8	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 (Jan 21) Ch. 3.1-3.6	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 (Jan 28) Ch. 3.7-3.9, 4.1-4.2	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 (Feb 4) Ch. 4.3-4.8	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
Week 6 Midterm	**Midterm, Tuesday Feb. 11, in class, chapters 2 and 3**	
Week 7 (Feb 18) Ch 5.1-5.2	Bivariate and multivariate distributions, Joint distributions, marginal distributions, conditional distributions, independence of two random variables, covariance and correlation.	5.1, 5.3, 5.9, 5.14, 5.16, 5.20, 5.23, 5.27, 5.34, 5.42
Week 8 (Mar 4) Ch 5.3-5.4	Common Joint Distributions: multinomial distribution, bivariate normal distribution. Linear functions of random variables.	**Quiz 3** 5.48, 5.49, 5.52, 5.54, 5.55, 5.62, 5.67, 5.70, 5.71, 5.78
Week 9 (Mar 11) Ch 6.1, 7.1-7.3 (excluding 7.3.4)	Numerical summaries of data, Probability plots. Point estimation, Sampling distributions, Central Limit Theorem, Unbiased estimators, variance of a point estimator, mean squared error.	6.12, 6.16, 7.4, 7.11, 7.12, 7.13, 7.14, 7.24, 7.29, 7.34
Week 10 (Mar 18) Ch 8.1-8.3,8.5	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 4** 8.1, 8.8, 8.10, 8.14, 8.17, 8.21, 8.31, 8.38, 8.52
Week 11 (Mar 25) Ch 8.7, 9.1	Tolerance and prediction intervals. Hypothesis Testing.	9.1, 9.3, 9.10, 9.15, 9.17, 9.20, 9.21, 9.25
Week 12 (Apr 1) Ch 9.2-9.4	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.	9.36, 9.40, 9.43, 9.48, 9.52, 9.58, 9.62, 9.65, 9.80, 9.83
Week 13 (Apr 8)	Review	

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	Project/exams
	Knowledge base in a specific domain	Advanced	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. Crib sheets will be provided.

Quizzes

Four quizzes will be given and the best 3 will be counted. The questions on the quizzes will be related to the suggested problems. Your best 3 quizzes will be used for 10% of your grade. The quizzes will take place in the tutorials.

Project

The project will be a team project. This will count for 15% of your grade.

Grading

Scheme A

Project   15%
Quizzes: 15%
Midterm: 20%
Final exam: 50%

Or

Scheme B

Project   15%
Quizzes: 15%
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.