

**Division of Engineering Science  
University of Toronto  
STA286 H1 S: Probability & Statistics**

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**Course Website:** <http://ccnet.utoronto.ca/20081/sta286h1s>

**Required Textbook:** R.E. Walpole, R.H. Myers, S.L. Myers, and K. Ye.  
*Probability & Statistics For Engineers & Scientists*,  
Eighth Edition, Prentice Hall, 2007.

**Lectures:** 2 hours per week

**Tutorials:** 1 hour per week

**Course Overview:**

A general introduction to probability and applied statistics for engineers. Topics include: definitions of sample space, events, probability, conditional probability, Bayes' theorem, an overview of discrete and continuous random variables and their distributions, joint, marginal, and conditional distributions, expectation, transformation of random variables moment generating function and characteristic function, central limit theorem, sampling distributions of  $\bar{X}$  and  $S^2$ ,  $\chi^2$ ,  $t$ , and  $F$  distributions, point and interval estimation of population parameters, method of maximum likelihood, hypotheses testing.

**Grading:**

Assignment 1: due Friday, February 15, beginning of lecture	10%
Term Test: Monday, March 3	30% C type
Assignment 2: due Wednesday, April 2, beginning of lecture	10%
Final Exam	50% C type

An aid sheet of size A4 or Letter will be permitted for the term test and for the final exam, written on both sides. Only non-programmable calculators will be permitted for the term test and for the final exam.

If you miss term work due to illness or personal reasons, please submit a term work petition to your STA286 instructor. The petition form can be found at:

<http://www.undergrad.engineering.utoronto.ca/support/registrar/petitions.htm>

Please note that petitions on final exams are considered by the faculty exams committee. Information can be found at the same weblink.

### Tentative Work Schedule

Week	Topic	Reading
1-2	Introduction to statistics and data analysis, the role of probability. Random sample, measures of location and variability. Graphical methods and data description. Histogram and dotplot. Sample space and events. Definitions of probability. Conditional probability and the Bayes' rule.	Chapter 1, Chapter 2, sections 2.1, 2.2, 2.4 - 2.8.
3-4	Concept of a random variable. Discrete and continuous probability distributions. Joint, marginal, and conditional distributions. Statistical independence. Mathematical expectation, variance, and covariance of random variables. Correlation coefficient.	Chapter 3, Chapter 4, sections 4.1- 4.3, 4.5.
5-7	Discrete probability distributions: discrete uniform, binomial and multinomial distributions, hypergeometric, negative binomial, and geometric distributions, Poisson distribution. Continuous probability distributions: continuous uniform, normal distribution and its applications, normal approximation to binomial, exponential and gamma distributions, lognormal, chi-squared, and Weibull distributions, the failure rate. Lognormal and Weibull distributions will be only mentioned at lectures, problems related to these distributions will not appear on Assignment 2 or on the Final Exam.	Chapter 5, Chapter 6, sections 6.1 - 6.11.
8	Transformations of discrete and continuous random variables. Moment generating function. Characteristic function. Moment generating and characteristic functions will be only mentioned at lectures, problems related to these topics will not be included in Assignment 2 or in the Final Exam.	Chapter 7.
9	Sampling distributions of $\bar{X}$ and $S^2$ . Central limit theorem. Distributions arising from the normal: chi-squared, $t$ , and $F$ distributions.	Chapter 8.
10-11	Estimation of population parameters. Point and interval estimators. Unbiased and most efficient estimator. Standard error of a point estimate. Confidence interval. Absolute and relative error, sample size. Single sample estimates. Method of maximum likelihood.	Chapter 9, sections 9.1-9.6, 9.12, 9.14, 9.15.
12-13	Hypothesis testing. Null and alternative hypotheses, type I and type II errors. Significance level, power of the test, and the p-value. Tests on means and variances for a single sample. Choice of sample size.	Chapter 10, sections 10.1-10.7, 10.9, pp. 350-352, 10.13, pp. 367-368.