# CAMOSUN COLLEGE
## *School of Arts & Science*
## *Department of Mathematics & Statistics*

### *STAT-254 all sections*
### *Probability and Stats for ENGR*
### *Winter 2019*

# COURSE OUTLINE

**The course description is available on the web @ http://camosun.ca/learn/calendar/current/web/stat.html**

Ω *Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.*

## 1. Instructor Information

| | | | |
|---|---|---|---|
| **(a)** | **Instructor** | Patricia Wrean (Pat) | |
| **(b)** | **Office hours** | posted on office door and on the course website | |
| **(c)** | **Location** | CBA 153 | |
| **(d)** | **Phone** | 250-370-4542 | **Alternative:** |
| **(e)** | **E-mail** | wrean@camosun.bc.ca | |
| **(f)** | **Website** | http://wrean.ca/ | |

## 2. Intended Learning Outcomes

Upon completion of this course students will be able to:

1.  Use probability theory to solve applied problems.
    a.  Calculate probabilities using simple events, counting techniques, and the properties of probability.
    b.  Calculate conditional probabilities.
    c.  Define and identify independent events, mutually exclusive events, and complementary events.
    d.  Calculate probabilities using Bayes' Theorem.
2.  Explore probability distributions of discrete and continuous random variables.
    a.  Solve problems involving probability distributions of discrete random variables including binomial, Poisson, hypergeometric, and negative binomial distributions.
    b.  Use integration to calculate the expected value and variance of continuous random variables, including the uniform and exponential distributions.
    c.  Use the Standard Normal Probability Table to solve problems involving the normal distribution.
3.  Use descriptive statistical techniques to organize, summarize, and display data in a meaningful way.
    a.  Describe a data set numerically by calculating the mean, median, and sample and population standard deviation.
    b.  Interpret histograms and other graphical displays of data sets.
    c.  Make predictions about the distribution of a data set using the Empirical Rule and Tchebyshev's Theorem.
4.  Use inferential statistical techniques to make predictions about populations.
    a.  Discuss issues associated with collecting and interpreting data from sample surveys.
    b.  Describe the sampling distributions of the sample mean and the sample proportion using the Central Limit Theorem.
    c.  For large samples, calculate point estimates and confidence intervals for population means and proportions, and determine appropriate sample sizes.
    d.  Perform large-sample hypothesis tests for population means and differences in means and for population proportions and differences in proportions.
    e.  For small samples, calculate point estimates and t-confidence intervals and perform t-tests for the population mean.
    f.  For small samples, use the chi-square distribution to construct confidence intervals and perform hypothesis testing for the population variance.

5. For a bivariate data set, calculate and interpret the coefficients of correlation and the coefficient of determination, and determine the least squares regression line when appropriate.

## 3. Required Materials

(a) The course materials are available on D2L: https://online.camosun.ca

(b) Calculator: Only regular scientific calculators (non-programmable, non-graphing) will be permitted for tests and exams. The use of other electronic devices such as cell phones, MP3 players, iPods, electronic translators, etc., during exams is not allowed.

## 4. Course Content and Schedule

| Section | Title |
|---------|-------|
| 1.1 | Variables and Data |
| 1.2 | Types of Variables |
| 1.3 | Graphs for Categorical Data |
| 1.4 | Graphs for Quantitative Data |
| 1.5 | Histograms |
| 1.6 | Measures of Central Tendency |
| 1.7 | Measures of Dispersion |
| 2.1 | The Role of Probability in Statistics |
| 2.2 | Events and the Sample Space |
| 2.3 | Calculating Probabilities using Simple Events |
| 2.4 | Useful Counting Rules |
| 2.5 | Event Relations and Probability Rules |
| 2.6 | Independence, Conditional Probability, and the Multiplication Rule |
| 2.7 | Bayes' Rule |
| 3.1 | Discrete Random Variables |
| 3.2 | Probability Distributions and Probability Mass Functions |
| 3.3 | Cumulative Distribution Functions |
| 3.4 | Mean and Variance of a Discrete Random Variable |
| 3.5 | Discrete Uniform Distribution |
| 3.6 | Binomial Distribution |
| 3.8 | Hypergeometric Distribution |
| 3.9 | Poisson Distribution |
| 4.1 | Describing Continuous Probability Distributions |
| 4.2 | Continuous Uniform Distribution |
| 4.3 | Exponential Distribution |
| 4.4 | Normal Probability Distribution |
| 5.1 | Sampling Plans and Experimental Design |
| 5.2 | Sampling Distributions |
| 5.3 | Central Limit Theorem |
| 5.4 | Statistical Process Control |
| 6.1 | Confidence Intervals for the Mean when Sigma is Known |
| 6.2 | Confidence Intervals for the Mean when Sigma is Unknown |
| 6.3 | Confidence Intervals for Proportions |
| 6.4 | Confidence Intervals for Variances and Standard Deviations |
| 7.1 | Statistical Hypotheses: General Concepts |
| 7.2 | Testing a Statistical Hypothesis |
| 7.3 | The Use of P-Values for Decision Making in Testing Hypothesis |
| 7.4 | Single Sample: Testing Concerning a Single Mean |
| 7.5 | Two Samples: Tests on Two Means |
| 7.6 | Choice of Sample Size for Testing Means |
| 7.8 | One Sample: Test on a Single Proportion |
| 7.9 | Two Samples: Tests on Two Proportions |
| 7.10 | One- and Two-Sample Tests Concerning Variances |
| 7.11 | Goodness-of-Fit Test |
| 8.1 | Scatter Diagrams and Correlation |
| 8.2 | Diagnostics on the Least-Squares Regression Line |
| 8.3 | Non-Linear and Multiple Linear Regression |

## 5. Basis of Student Assessment (Weighting)

**Assignments:** 5%

Online assignments close on the due date and late submissions will not be accepted. The lowest assignment grade will be dropped when calculating the average of your assignments. This allows a student to miss one assignment for any reason, including illness, without penalty.

**Tests**: 45%

There will be two term tests. The first time a student misses a test for any reason, the weight of the missed test will be transferred to the final exam. No documentation is required for the first absence. For any further absences, documentation is required or a zero will be given. There are no make-up tests.

**Final Exam**: 50%

If your final exam grade is higher than your term grade <u>and</u> your term grade is 40% or higher, then your final exam grade will count as 100% of your final grade.

The final exam will cover the entire course and will be 3 hours long. As stated in the current college calendar, "students are expected to write tests and final examinations at the scheduled time and place." Exceptions will only be considered due to **emergency** circumstances as outlined in the calendar. Holidays or scheduled flights are not considered to be emergencies.

**Academic Integrity:** The Department of Mathematics and Statistics has prepared a handout called *Student Guidelines for Academic Integrity* to help you interpret college policies involving student conduct, academic dishonesty plagiarism, etc. A copy of it is posted to the course website on the About page. It is your responsibility to become familiar with the contents of the document and the college policies it references.

## 6. Grading System

| x | Standard Grading System (GPA) |

| | Competency Based Grading System |

## 7. Recommended Materials to Assist Students to Succeed Throughout the Course

The Math Lab in Tech 142 is a drop-in centre with a tutor on staff (see hours posted on door) and study space for students working on math homework.

Students with disability-related academic barriers are encouraged to consult with the Centre for Accessible Learning (CAL) to see whether they are eligible for exam or in-class accommodations. The CAL website is http://camosun.ca/services/accessible-learning/ .

## 8. College Supports, Services and Policies

**Immediate, Urgent, or Emergency Support**
If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ http://camosun.ca/about/mental-health/emergency.html or http://camosun.ca/services/sexual-violence/get-support.html#urgent

**College Services**
Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at http://camosun.ca/

**College Policies**

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at http://camosun.ca/about/policies/. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

## A. GRADING SYSTEMS *http://www.camosun.bc.ca/policies/policies.php*

**The following two grading systems are used at Camosun College:**

### 1. Standard Grading System (GPA)

| Percentage | Grade | Description | Grade Point Equivalency |
|---|---|---|---|
| 90-100 | A+ | | 9 |
| 85-89 | A | | 8 |
| 80-84 | A- | | 7 |
| 77-79 | B+ | | 6 |
| 73-76 | B | | 5 |
| 70-72 | B- | | 4 |
| 65-69 | C+ | | 3 |
| 60-64 | C | | 2 |
| 50-59 | D | | 1 |
| 0-49 | F | Minimum level has not been achieved. | 0 |

### 2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

| Grade | Description |
|---|---|
| COM | The student has met the goals, criteria, or competencies established for this course, practicum or field placement. |
| DST | The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement. |
| NC | The student has not met the goals, criteria or competencies established for this course, practicum or field placement. |

## B. Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at http://www.camosun.bc.ca/policies/E-1.5.pdf for information on conversion to final grades, and for additional information on student record and transcript notations.

| Temporary Grade | Description |
|---|---|
| I | *Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family. |
| IP | *In progress*: A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course. |
| CW | *Compulsory Withdrawal*: A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement. |

## 9. Territorial Acknowledgement

Camosun College campuses are located on the traditional territories of the Lkwungen and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.