

# COURSE SYLLABUS



COURSE TITLE: STAT-254: Probability and Statistics for Engineers

CLASS SECTION: X 01

TERM: Fall 2024

COURSE CREDITS: 3

DELIVERY METHOD(S): Lecture

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

Learn more about Camosun's [Territorial Acknowledgement](#).

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## INSTRUCTOR DETAILS

NAME: Fan Wu PhD

EMAIL: [wuf@camosun.ca](mailto:wuf@camosun.ca)

OFFICE: CBA 153

HOURS: Monday, Tuesday, Thursday 11:30 – 12:30 and by appointment.

*As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.*

## CALENDAR DESCRIPTION

This calculus-based introductory statistics course includes counting techniques, introductory probability, Bayes' theorem, measures of central tendency and variation, expected value, discrete and continuous distributions, point and interval estimation, hypothesis testing, correlation and linear regression. Applications to engineering are included throughout the course. Only open to Engineering Bridge students.

### PREREQUISITE(S):

Restricted to students in Engineering Bridge

### CO-REQUISITE(S):

Not Applicable

### EXCLUSION(S):

Not Applicable

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## COURSE LEARNING OUTCOMES / OBJECTIVES

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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.

## REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

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- (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.
- (c) Software: some assignments will require the use of R – free open source statistical software. Download instructions will be on D2L

## COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

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The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor. Since there is no designated lab component for the class, the use of software will be embedded into assignments and lectures using the open source software R.

WEEK or DATE RANGE	ACTIVITY or TOPIC	OTHER NOTES
Week 1	Course overview, Descriptive statistics Descriptive statistics, histograms, boxplots Probability and Set Theory	
Week 2	Probability Conditional Probability Bayes' Theorem	
Week 3	Independence Discrete random variables Expectations and Variance of a discrete random variables	
Week 4	Binomial distribution Poisson distribution	
Week 5	Continuous distributions Expectations of continuous distributions uniform distribution <b>Test 1</b>	
Week 6	Normal distribution exponential distribution	
Week 7	Statistics and their distributions The Central Limit Theorem Confidence intervals for normal (variance known) and large samples	
Week 8	Hypothesis testing (Z-test) Hypothesis testing and Confidence intervals for normal samples (variance unknown), Student's t distribution (t-test)	

WEEK or DATE RANGE	ACTIVITY or TOPIC	OTHER NOTES
Week 9	Hypothesis testing and Confidence intervals for a Binomial proportion <b>Test 2</b>	
Week 10	Inference for two samples, large sample and normal cases Paired data case	
Week 11	Inference for two Binomial samples	
Week 12	Chi-Squared Distribution Chi-Squared tests	
Week 13	coefficients of correlation and the coefficient of determination <b>Test 3</b>	
Week 14	Simple linear regression (least squares regression)	
Week 15	Final Exam (to be scheduled by College Registrar, posted on myCamosun)	

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced notice is required. Deadlines can be reviewed on the [CAL exams page](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

## EVALUATION OF LEARNING

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DESCRIPTION	WEIGHTING
On-line Assignments (Three Assignments via D2L)	6%
R Assignments	6%
Tests (Three Term tests):	48%
Final Exam	40%
<b>TOTAL</b>	<b>100%</b>

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the [Grade Review and Appeals](http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf) policy for more information.  
<http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>

## COURSE GUIDELINES & EXPECTATIONS

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### **Lecture Attendance:**

To get the most out of this course, students are expected to attend all classes and be on time. It is your responsibility to acquire all information given during a class missed, including notes, hand-outs, changed exam dates etc.

### **Missing Items:**

If you miss a test and/or an assignment due to illness, accident, or family affliction, you should notify your instructor via email as soon as possible.

### **Final Exam:**

Students are strongly advised not to make plans for travel or employment during the final examination period as special arrangements will not be made for examinations that conflict with such plans. Students must write the final exam in order to pass the course.

## SCHOOL OR DEPARTMENTAL INFORMATION

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### Interurban Math Lab

Services: Individual tutoring and study space

Location: TEC 142

Schedule: posted on the door

Format: Drop in - first-come, first-served

### Chair of the Math & Stats Department: Patrick Montgomery

Phone: 250-370-3502

Office: Ewing 268, Lansdowne Campus

Email: [montgomeryp@camosun.ca](mailto:montgomeryp@camosun.ca)

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. It is your responsibility to become familiar with the contents of the document and the college policies it references.

## STUDENT RESPONSIBILITY

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Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

## SUPPORTS AND SERVICES FOR STUDENTS

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Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit <http://camosun.ca/students/>.

Academic Advising	<a href="http://camosun.ca/advising">http://camosun.ca/advising</a>
Accessible Learning	<a href="http://camosun.ca/accessible-learning">http://camosun.ca/accessible-learning</a>
Counselling	<a href="http://camosun.ca/counselling">http://camosun.ca/counselling</a>
Career Services	<a href="http://camosun.ca/coop">http://camosun.ca/coop</a>
Financial Aid and Awards	<a href="http://camosun.ca/financialaid">http://camosun.ca/financialaid</a>
Help Centres (Math/English/Science)	<a href="http://camosun.ca/help-centres">http://camosun.ca/help-centres</a>
Indigenous Student Support	<a href="http://camosun.ca/indigenous">http://camosun.ca/indigenous</a>
International Student Support	<a href="http://camosun.ca/international/">http://camosun.ca/international/</a>
Learning Skills	<a href="http://camosun.ca/learningskills">http://camosun.ca/learningskills</a>
Library	<a href="http://camosun.ca/services/library/">http://camosun.ca/services/library/</a>
Office of Student Support	<a href="http://camosun.ca/oss">http://camosun.ca/oss</a>
Ombudsperson	<a href="http://camosun.ca/ombuds">http://camosun.ca/ombuds</a>
Registration	<a href="http://camosun.ca/registration">http://camosun.ca/registration</a>
Technology Support	<a href="http://camosun.ca/its">http://camosun.ca/its</a>
Writing Centre	<a href="http://camosun.ca/writing-centre">http://camosun.ca/writing-centre</a>

If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

## COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

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### Academic Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](http://camosun.ca/services/accessible-learning/) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started:

<http://camosun.ca/services/accessible-learning/>

### Academic Integrity

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

### Academic Progress

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.1.pdf> for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

### Course Withdrawals Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

### Grading Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

### Grade Review and Appeals

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

### Mandatory Attendance for First Class Meeting of Each Course

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the "Attendance" section under "Registration Policies and Procedures" (<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

### Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> to learn more about the process involved in a medical/compassionate withdrawal.

### Sexual Violence and Misconduct

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun's Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence or misconduct occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student's right to choose what is right for them. For more information see Camosun's Sexualized Violence and Misconduct Policy: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and [camosun.ca/sexual-violence](http://camosun.ca/sexual-violence). To contact the Office of Student Support: [oss@camosun.ca](mailto:oss@camosun.ca) or by phone: 250-370-3046 or 250-3703841

### Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College's Student Misconduct Policy at <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

**Changes to this syllabus:** Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.