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| CAMOSUN COLLEGE | ***School of Arts & Science***<br>***MATHEMATICS DEPARTMENT***<br>**MATH 264-X01**<br>**Applied Probability and Statistics**<br>**2007Q3** |

# COURSE OUTLINE

**The Approved Course Description is available on the web @ _____**

Ω *Please note: this outline will be electronically stored for five (5) years only. It is strongly recommended students keep this outline for your records.*

## 1. Instructor Information

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|---|---|---|---|---|
| (a) | Instructor: | Patricia Wrean (Pat) | | |
| (b) | Office Hours: | Posted on office door and on website. | | |
| (c) | Location: | CBA 153 | | |
| (d) | Phone: | 370-4542 | Alternative Phone: | |
| (e) | Email: | wrean@camosun.bc.ca | | |
| (f) | Website: | http://wrean.disted.camosun.bc.ca/ | | |

## 2. Intended Learning Outcomes

*(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)*

Upon completion of this course the student will be able to:

1. Represent a data set using a stem-and-leaf display, histogram and relative frequency polygon.
2. Evaluate the mean, sample variance, population variance, sample standard deviation, population standard deviation, median and mode for a discrete data set.
3. Represent a data set using a boxplot.
4. Perform calculations using the axioms and properties of probability and conditional probability.
5. Perform calculations using the concepts of mutually exclusive events, independent events and complement of an event as well as the addition, multiplication and complement theorems.
6. Make predictions using Chebyshev's Theorem.
7. Perform calculations using Bayes' Theorem and its application.
8. Distinguish between discrete and continuous random variables.
9. Calculate probabilities using the probability distribution of a discrete random variable and the probability density function of a continuous random variable.
10. Calculate the cumulative distribution of a random variable and use it to calculate probabilities.
11. Calculate expected value of a random variable and expected value of a function of a random variable.
12. Calculate moments.
13. Perform calculations using the formula: variance = second moment – square of the first moment.

14. Evaluate the mean and variance of Bernoulli, Binomial, Poisson, Uniform, Normal, Exponential and Chi-Square random variables.
15. Evaluate the median of a continuous distribution.
16. Approximate a binomial distribution or a Poisson distribution by a normal distribution.
17. Create a joint probability distribution and use it to calculate probabilities.
18. Explain what a statistic is.
19. Describe the distribution of the sample mean.
20. Perform calculations and make predictions using the Central Limit Theorem.
21. Estimate a population parameter using the ideas of point estimation, unbiased estimators and estimators with minimum variance.
22. Describe and calculate a maximum likelihood estimator.
23. Calculate a confidence interval and use it make appropriate predictions regarding a population mean or proportion.
24. Use the t-distributions to evaluate the confidence intervals based on a normal population distribution.
25. Evaluate the confidence intervals for the variance of a normal population.
26. Describe what an hypothesis is and how it is used in statistics.
27. Describe type I error, type II error and p-value of a test; evaluate p-value of a test; and evaluate the type II errors for a given type I error of a test.
28. Design tests concerning population means and population proportions under different conditions such as small sample sizes, normal populations, known variances, unknown variances and their combinations.
29. Apply the simple linear regression model and know how to estimate the model parameters.
30. Construct a sample mean chart.
31. Construct an operating characteristic curve for a sampling plan.

## 3. Required Materials

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|---|---|---|
| (a) | Texts | Mendenhall, Beaver, and Beaver, "Introduction to Probability and Statistics", 12th edition, Thomson Brooks/Cole (2006). |
| (b) | Other | |

## 4. Course Content and Schedule

*(Can include: class hours, lab hours, out of class requirements and/or dates for quizzes, exams, lectures, labs, seminars, practicums, etc.)*

**CHAPTER 0 Introduction: An Invitation to Statistics**

| Text | Time | |
|---|---|---|
| 0.1-0.3 | 1.0 | The Population and the Sample, Descriptive and Inferential Statistics, Achieving the Objective of Inferential Statistics |
| Total | 1.0 | lecture hours |

**CHAPTER 1 Describing Data with Graphs**

| Text | Time | |
|---|---|---|
| 1.1-1.2 | 1.0 | Variables and Data, Types of Variables |
| 1.3 | 1.0 | Graphs for Categorical Data |
| 1.4 | 1.0 | Graphs for Quantitative Data |

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|---|---|---|
| 1.5 | 1.0 | Stem and Leaf Displays, Interpreting Graphs with a Critical Eye, Relative Frequency Distributions |
| Total | 5.0 | lecture hours |

**CHAPTER 2 Describing Data with Numerical Measures**

| Text | Time | |
|---|---|---|
| 2.1-2.2 | 1.0 | Describing a Set of Data with Numerical Measures, Measures of Centre |
| 2.3 | 1.0 | Measures of Variability |
| 2.4-2.7 | 2.0 | On the Practical Significance of the Standard Deviation, A Check on the Calculation of *s,* Measures of Relative Standing, The Box Plot |
| Total | 4.0 | lecture hours |

**CHAPTER 4 Probability and Probability Distributions**

| Text | Time | |
|---|---|---|
| 4.1-4.2 | 1.0 | The Role of Probability in Statistics, Events and the Sample Space |
| 4.3-4.3 | 1.0 | Calculating Probabilities using Simple Event, Useful Counting Rules |
| 4.5 | 1.0 | Event Relations and Probability Rules |
| 4.6 | 1.0 | Conditional Probability, Independence, and the Multiplicative Rule |
| 4.7 | 1.0 | Bayes' Rule |
| 4.8 | 1.0 | Discrete Random Variables and Their Probability Distributions |
| Total | 6.0 | lecture hours |

**CHAPTER 5 Several Useful Discrete Distributions**

| Text | Time | |
|---|---|---|
| 5.1-5.2 | 2.0 | The Binomial Probability Distribution |
| 5.3-5.4 | 1.0 | The Poisson Probability Distribution, The Hypergeometric Probability Distribution |
| Total | 3.0 | lecture hours |

**CHAPTER 6 The Normal Probability Distribution**

| Text | Time | |
|---|---|---|
| 6.1-6.2 | 1.0 | The Normal Probability Distribution |
| 6.3 | 2.0 | Tabulated Areas of the Normal Probability Distribution |
| 6.4 | 1.0 | The Normal Approximation to the Binomial Probability Distribution |
| Total | 4.0 | lecture hours |

**CHAPTER 7 Sampling Distributions**

| Text | Time | |
|---|---|---|
| 7.1-7.2 | 1.0 | Sampling Plans and Experimental Designs |

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|---|---|---|
| 7.3 | 1.0 | Statistics and Sampling Distributions |
| 7.4 | 1.0 | The Central Limit Theorem |
| 7.5 | 1.0 | The Sampling Distribution of the Sample Mean, Standard Error |
| 7.6-7.7 | 1.0 | The Sampling Distribution of the Sample Proportion, Control Charts |
| Total | 5.0 | lecture hours |

**CHAPTER 8 Large-Sample Estimation**

| **Text** | **Time** | |
|---|---|---|
| 8.1-8.3 | 1.0 | Statistical Inference, Types of Estimators |
| 8.4 | 1.0 | Point Estimation |
| 8.5 | 2.0 | Interval Estimation |
| 8.6 | 1.0 | Estimating the Difference between Two Population Means |
| 8.7 | 1.0 | Estimating the Difference between Two Binomial Population |
| 8.9 | 1.0 | Choose the Sample Size |
| Total | 7.0 | lecture hours |

**CHAPTER 9 Large-Sample Tests of Hypotheses**

| **Text** | **Time** | |
|---|---|---|
| 9.1-9.2 | 1.0 | A Statistical Test of Hypothesis |
| 9.3 | 1.0 | A Large-Sample Test of Hypothesis about a Population Mean, p-value |
| 9.4 | 1.0 | A Large-Sample Test of Hypothesis for the Difference between Two Population Means |
| 9.5 | 1.0 | A Large-Sample Test of Hypothesis for a Binomial Proportion |
| 9.6 | 1.0 | A Large-Sample Test of Hypothesis for the Difference between Two Binomial Proportions |
| Total | 5.0 | lecture hours |

**CHAPTER 10 Inference from Small Samples**

| **Text** | **Time** | |
|---|---|---|
| 10.1-10.3 | 1.0 | Student's *t* Distribution, Small-Sample Inferences Concerning a Population Mean |
| 10.4-10.6 | 1.0 | Small-Sample Inferences for the Difference between Two Population Means, Inferences Concerning a Population Variance |
| Total | 2.0 | lecture hours |

**CHAPTER 12 Linear Regression and Correlation**

| **Text** | **Time** | |
|---|---|---|
| 12.1-12.3 | 2.0 | The Method of Least Squares |
| 12.7 | 1.0 | Estimation and Prediction Using the Fitted Line |
| 12.8 | 1.0 | Correlation Analysis |
| Total | 4.0 | lecture hours |

## 5. Basis of Student Assessment (Weighting)

*(Should be linked directly to learning outcomes.)*

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|---|---|---|
| (a) | Assignments | 10% |
| (b) | Quizzes | 40% |
| (c) | Exams | 50% |
| (d) | Other (eg, Attendance, Project, Group Work) | |

The lowest quiz grade will be dropped when calculating the average of your quizzes. This allows a student to be absent on any one quiz day for any reason, including illness, without penalty. There is no provision for "making up" a missed quiz.

If your final exam grade is higher than your term work grade and your term work is **50% or higher**, then your final exam grade will count as 100% of your final grade.

Late assignments will be given a penalty of 25% per week.

## 6. Grading System

*(No changes are to be made to this section, unless the Approved Course Description has been forwarded through EDCO for approval.)*

### Standard Grading System (GPA)

| Percentage | Grade | Description | Grade Point Equivalency |
|---|---|---|---|
| 95-100 | A+ | | 9 |
| 90-94 | A | | 8 |
| 85-89 | A- | | 7 |
| 80-84 | B+ | | 6 |
| 75-79 | B | | 5 |
| 70-74 | B- | | 4 |
| 65-69 | C+ | | 3 |
| 60-64 | C | | 2 |
| 50-59 | D | | 1 |
| 0-49 | F | Minimum level has not been achieved. | 0 |

### 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 **camosun.ca** or 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. |

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| **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. |

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 E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

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

### LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services or the College web site at camosun.ca.

### STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**.
It is the student's responsibility to become familiar with the content of this policy. The policy is available in each School Administration Office, at Student Services and on the College web site in the Policy Section.

ADDITIONAL COMMENTS AS APPROPRIATE OR AS REQUIRED