	School of Arts & Science **MATHEMATICS AND STATISTICS DEPARTMENT** **STAT 216** **Applied Statistics** **Winter 2017**

COURSE OUTLINE

This is an introductory statistics course for first- or second-year students in Biology, Business, Chemistry, Applied Chemistry and Biotechnology, and Environmental Technology. Students will study descriptive statistics, probability, Binomial, Poisson and Normal distributions, hypothesis testing, confidence intervals, analysis of variance, correlation and linear regression**,** and categorical data analysis. Students will also learn to use statistical software to solve practical problems in the labs.

✷ *Please note: the College electronically stores this outline for five (5) years only.*
   *It is **strongly recommended** you keep a copy of this outline with your academic records.*
   You will need this outline for any future application/s for transfer credit/s to other colleges/universities.

1.   Instructor Information

(a)	Instructor:	Fan Wu
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(f)	Desire2Learn page	http://online.camosun.ca/
(g)	WeBWorK	http://webworklans.camosun.ca/webwork2/Stat216-Winter2017/
(h)	Office Hours:	Tueaday , Thursday 05:00-06:00

2.   Required Materials

> **1. Textbook** *Introductory Statistics A Problem Solving Approach* by Kokoska, 2e.
> **2. Lab manual**: Stat 216 R Lab Manual available on D2L.
> **3**. **Sharp EL-531 Scientific Calculator**. *No other calculators are allowed for tests and the final examination.*

2.   Intended Learning Outcomes

1. Use descriptive statistical methods to display and describe distributions of data
   a. Construct and interpret stemplots, histograms, boxplots, and timeplots.
   b. Compute and interpret the mean, median, quartiles, variance, and standard deviation.
   c. Identify outliers and describe the centre, spread, and shape of a distribution.
   d. Compute Normal probabilities and find percentiles for normal distributions.
2. Explore relationships between two variables
   a. Construct and interpret scatterplots and identify outliers and influential points.
   b. Compute and interpret correlation and coefficient of determination.
   c. Perform least-squares regression analysis including compute and interpret the least-square regression line, predictions, and residuals, and check the validity of the regression procedure.
   d. Construct and interpret two-way tables, joint distribution, marginal distribution, and conditional distribution.
3. Define and recognize processes that generate data
   a. Distinguish between experiments and observational studies.
   b. Define and apply basic sampling techniques to produce samples.
4. Apply probability theory to solve problems
   a. Define and identify sample space, complements, union and interaction of events, independent events, and mutually exclusive events.
   b. Use basic properties and concepts of probability to compute and interpret probabilities, and apply Bayes' rule to compute conditional probabilities.
   c. Give examples of discrete and continuous random variables, and compute the means and variances of discrete random variables.
   d. Solve practical problems using Binomial distribution, Poisson distribution, and Normal approximation to the Binomial.

e. State the Central Limit Theorem and apply it to solve practical problems
5. Use inferential statistical methods to estimate and test hypotheses about population parameters
    a. Compute and interpret confidence intervals for the mean, the proportion, the difference between two means, and the difference between two proportions, and calculate the least sample size.
    b. Perform basic hypothesis tests including one sample t-test, two-sample t-test, paired t-test, and pooled t-test about the means, and one-sample z-test and two-sample z-test about the proportions.
    c. Define and identify Type I and Type II errors and the power of hypothesis tests, define and compute the p-values.
6. Use the Chi-Square test to analyze categorical variables
    a. Apply the Chi-Square goodness-of-fit test to test the distribution of a variable
    b. Apply the Chi-Square test to test the independence of two categorical variables
    c. Apply the Chi-Square test to test homogeneity among populations
7. Use inferential statistical methods to estimate and test hypothesis about regression line parameters
    a. Calculate and interpret point and interval estimates for the intercept and the slope of the regression line,
    b. Test hypotheses about the intercept and slope of the regression line
    c. Compute and interpret prediction interval and confidence interval for a mean response, and perform residual analysis.
8. Perform the one-way ANOVA procedure
    a. Set up the one-way ANOVA model and compute estimates of population means
    b. Construct the one-way ANOVA table, and perform the F-test.
9. Use statistical software such as R to perform basic statistical procedures described above.

4. Course Content and Schedule

An Introduction to Statistics and Statistical Inference	1.1 – 1.3
Tables and Graphs for Summarizing Data	2.1 – 2.4
Numerical Summary Measures	3.1 – 3.4
Probability	4.1 – 4.5
Random Variables and Discrete Probability Distributions	5.1 – 5.5 (Poisson only)
Continuous Probability Distributions	6.1 – 6.3
Sampling Distributions	7.1 – 7.3
Confidence Intervals Based on a Single Sample	8.1 – 8.4
Hypothesis Tests Based on a Single Sample	9.1 – 9.6
Confidence Intervals and Hypothesis Tests Based on Two Samples	10.1 – 10.4
The Analysis of Variance	11.1
Correlation and Linear Regression	12.1 – 12.4
Categorical Data and Frequency Tables	13.1 – 13.2

R Labs: This course includes 7 lab sessions. You will need the lab manual for each lab. The lab manual is available on D2L under the Labs section of Content. The labs are designed to familiarize you with the use of a computer as a tool for statistical analysis. The computer software we use is R. Each lab session includes a lab assignment to be submitted for marking. Lab assignments must be handed in by **4:30pm** on the due date. Late labs will be accepted with a penalty of 20% per day until the on time labs have been handed back, after which I will no longer accept them. There will be a lab final exam due in the last week of classes.

Homework Assignments: There will be **online** homework assignments to cover basic concepts as well as a few questions from the later chapters to be handed in. Hand in questions are due by **the time specified on the assignment**. Late hand-in assignments will be accepted with a penalty. Late online assignments will not be accepted unless there is a documented medical or compassionate reason. There will also be a set of suggested problems from the textbook. In order to get a full understanding of the course materials **you need to do both sets of homework**.

Math Lab: Math lab **E224** is staffed with math tutors available for **free** help. It is a great idea to do your homework there and get help whenever needed.
Attendance: Showing up to class is the easiest and most important thing you can do to help succeed the course. Keeping up is an essential part of any statistics course as much of the material builds on itself. If you feel yourself falling behind at any point during the term, then please do not hesitate to come speak to me.

Missed Test Policy: Students are expected to make every reasonable effort to write the test at the scheduled time. **A missed test usually counts as a 0**, so if for any reason it appears that you may miss a test, **before the test**, talk with the instructor about missing the test, unless an unforeseen emergency makes this impossible, in which case leave a comprehensive message.
Please inquire if you have any questions or concerns about your particular situation.

5. Basis of Student Assessment (Weighting)

Assignments (online and hand in)	10%
Labs	5%
Tests	35%
Lab Final	10%
Cumulative Final Exam	40%

Please refer to **my website** for tentative *test dates* and *lab due dates*.

Final examinations will be scheduled by the college and they will take place during April 18-26. You must be available to write the final examination at the scheduled time. Holidays or scheduled flights are not considered to be emergencies.

6. Grading System
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	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	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 E-1.5 at **camosun.ca** 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, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. *(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
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.*

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 the College web site in the Policy Section.

Suggested Problems in the Textbook	
Section	Numbered Problems
1.2	1-15 odd
1.3	21, 23, 27-31 odd, 35, 37
Chpt 1	41, 45, 47, 51ab, 53
2.1	1-13 odd
2.2	19, 21, 25, 27
2.3	45, 47, 49, 53, 55, 57
2.4	69-81 odd, 87, 89, 93*
Chpt 2	97, 99, 101, 105
3.1	2 not d,e, 3-9, 13-15 odd, 25, 27*
3.2	33-37 odd, 41-49 odd
3.3	69-73 odd, 77, 79, 81, 85, 87
3.4	97-109 odd
Chpt 3	119, 121, 123ab, 129
4.1	1-11 odd, 15-23 odd, 29
4.2	39-49 odd, 53, 55, 57, 61
4.3	73-81 odd, 85, 89, 95
4.4	109-113 odd, 119-125 odd
4.5	137, 139, 141b-d, 147-151 odd, 157-161* odd
Chpt 4	173, 179, 181, 183a,b,c*
5.1	3, 7, 9, 13, 15, 17
5.2	21, 25, 29, 33, 35, 37
5.3	45, 47, 53, 55a, 57a-c, 59ab
5.4	71-81, 87, 89, 93, 95
5.5	109, 115, 119a-c*, 121a-c, 125, 129
Chpt 5	139, 145a-c, 147a-c*, 149, 151ab
6.1	1-7 odd, 13, 15a-c
6.2	27-35 odd, 43, 45, 51a-c, 55d
6.3	72
Chpt 6	107ab, 111ab, 115, 119
7.1	1, 3, 9, 11
7.2	27-33 odd, 37, 39, 41a-d* 43, 47, 49
7.3	61, 65, 67, 71, 73a-c, 75, 79
Chpt 7	91, 93, 95, 97, 99a-c, 101
8.1	1-7 odd, 11, 13
8.2	19-23 odd, 27, 29, 31, 37, 39, 43
8.3	55-61 odd, 67ab, 69, 73, 75, 79
8.4	91-99 odd, 103, 107, 109, 111, 115
Chpt 8	157, 159a,c, 161, 163, 167, 169
9.1	1-15 and 19-31 odd
9.3	57, 61-65 odd, 69, 71a-d, 75-79, 83-87 odd
9.4	99, 103-107 odd, 113, 115, 119
9.5	125-129 odd, 135-139 odd, 143-149 odd
9.6	167, 169, 171, 177-191 odd
9.2	33-35 odd, 37a-c, 41, 43, 45
Chpt 9	233, 237, 239, 243, 247
10.1	3- 11 odd, 15-23 odd
10.2	37, 43b, 45, 49, 51, 53, 55 assuming unequal variance for all
10.3	67, 73, 79
10.4	97, 99, 103, 109, 111, 113, 115, 117
Chpt 10	153, 163
13.1	1-7 odd, 11-21 odd
13.2	33-39 odd, 43-51 odd
Chpt 13	59, 61, 63, 65, 67,
11.1	1, 3, 11(not b), 13, 25
Chpt 11	89, 103
12.1	9, 11, 13ab, 25(no plot), 31ac
12.2	47a(no ANOVA)c-e, 61c (no plot)
12.4	89, 91, 95, 97