UNIVERSITY OF CALGARY

FACULTY OF SCIENCE
**Department of Mathematics and Statistics**

## Statistics 217 Introduction to Statistics II

(see Course Descriptions for the applicable academic year: http://www.ucalgary.ca/pubs/calendar/)

## *Syllabus*

| **Topics** | **Number of hours** |
|---|---|
| ESTIMATION<br>Point and interval estimation. Unbiased estimators. Confidence intervals for means, proportions, and their differences. Required sample size for given interval width. Optional: Notched Box-and-whisker plots. | 4 |
| HYPOTHESIS TESTING: ONE SAMPLE<br>Introduction to hypothesis testing. Acceptance and rejection regions. Type I and Type II errors and their probabilities. Hypotheses about means and proportions including Student T-test. Power function of a test involving the mean and proportion. Hypothesis testing and confidence interval for the variance, Chi-squared distribution. | 8 |
| HYPOTHESIS TESTING: TWO SAMPLES<br>Distribution of the difference of two sample means and proportions. Comparisons of two means and two proportions including paired Student T-test. Optional: Levene's test or Fisher's distribution and comparison of two variances. | 5 |
| CHI-SQUARED TESTS<br>Goodness of fit tests to uniform, binomial, Poisson and Normal distributions. Tests of homogeneity, independence and contingency tables. | 4 |
| ANALYSIS OF VARIANCE<br>One way analysis of variance including F-test. Two way analysis of variance with one observation per cell. | 3 |
| LINEAR REGRESSION<br>Linear regression model, scattergrams, Least Squares Method. Estimation of the intercept and slope, confidence intervals and tests. Regression ANOVA and the F-test. Coefficients of correlation and determination. Predictions and their confidence intervals. Multivariate and polynomial regression. | 7 |
| NON-PARAMETRIC TESTS<br>Selection of non-parametric tests from the following list: Sign test, Mann-Whitney test, Wilcoxon signed-ranks test, Kruskal-Wallis test, Kolmogorov-Smirnov test. | 5 |
| **TOTAL HOURS** | 36 |

# *Course Outcomes*

Expectations: A student successfully completing Statistics 217 is expected to:

1. Conduct appropriate parametric and/or non-parametric single and multiple population comparisons (for both qualitative and quantitative data types), applying confidence interval estimation and hypothesis testing. Verify the necessary conditions of: the Normality, the equality of variance, and the dependence of the data structure(s).

2. Recognize and distinguish between Type I and Type II errors that accompany statistical hypothesis testing. Displaying the ability to calculate the probabilities associated with these errors, for both single population proportions and large sample sized population means.

3. Evaluate the correlation between bivariate data for two qualitative variables.

4. Determine the 'Goodness-of-Fit' of an empirical data set to the well-known probability models: Binomial, Poisson, as well as any specified well-defined model.

5. Model and verify the statistical significance of the model relating two quantitative variables (least- squares estimation). Demonstrate awareness of the conditions of the linear model and validate that these conditions are met through various techniques. Produce confidence interval estimation of both the mean and an individual value of the response variable.

6. Display and interpret the least-squares-estimate for Multiple Linear Regression. To defend, model, and verify the statistical significance of the regression equation's estimate from two or more quantitative and/or qualitative independent variables.

7. Conduct population parameter comparisons between three or more quantitative variables through the employment of the balanced: One-Way-ANOVA/Post Hoc inference (Tukey's HSD), Two- Way-ANOVA (including repetition), and with selected Non-parametric counterparts.

8. Demonstrate how to use critical thinking, formulae, and statistical software to provide solutions for both theoretical and practical applications of course material.

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Calendar change H(3-2) to H(3-1-1T) Fall 2009