STAT – STATISTICS

STAT 151
Introduction to Applied Statistics
3 Credits Weekly (3-1.5-0)
In this course the following topics are covered: data collection and presentation; descriptive statistics; probability distributions, sampling distributions and the central limit theorem; point estimation, confidence intervals, and hypothesis testing; one-way ANOVA; Chi-square tests; and correlation and regression analysis. Applications are taken from a broad variety of fields such as biological and medical sciences, engineering, social sciences and economics. Note: This course may not be taken for credit if credit has been obtained in Stat 161.
Prerequisites: Mathematics 30-1 or Mathematics 30-2 or successful completion of the statistics gateway exam.

STAT 161
Applied Statistics for the Social Sciences
3 Credits Weekly (3-1.5-0)
This course provides an introduction to descriptive and inferential statistics with a focus on data analytic tools particularly relevant in the social sciences. Topics covered in this course include descriptive statistics, basic probability theory and the central limit theorem; estimation and hypothesis testing; t-tests, analysis of contingency tables, one way ANOVA, and multiple linear regression analysis. Applications are taken from the social sciences and many other fields such as biological and medical sciences, engineering, and economics. Note: Credit cannot be obtained in both STAT 151 and 161.
Prerequisites: Mathematics 30-1 or Mathematics 30-2 or successful completion of the statistics gateway exam.

STAT 252
Applied Statistics II
3 Credits Weekly (3-2-0)
Fundamental methods in applied statistics are presented in this course including the following topics: factorial ANOVA and Linear Regression models and their analysis as well as non-parametric statistical tools for the comparison of the centre of distributions. Applications are taken from a broad variety of areas such as biological, social and computer sciences, engineering, and economics.
Prerequisites: A minimum grade of C- in one of STAT 151 or STAT 161.

STAT 265
Probability Theory I
3 Credits Weekly (3-0-1)
This course offers a calculus-based introduction to probability theory. Topics covered include sample space, events, combinatorial probability, conditional probability, independent events, Bayes' theorem, discrete and continuous random variables, univariate and multivariate probability distributions, expectation, conditional expectation, joint probability distributions, independence, moment generating functions. Note: STAT 151 is recommended and MATH 214 is a recommended corequisite.
Prerequisites: A minimum grade of C- in MATH 115.

STAT 266
Mathematical Statistics
3 Credits Weekly (3-1-1)
The emphasis of this course is to present the fundamental statistical concepts in estimation and hypothesis testing from a classical perspective using the tools of probability theory. Topics covered include: limit theorems, sampling distributions, methods of point estimation and properties of point estimators, interval estimation, testing hypotheses. Statistical software is used to simulate distributions and probabilistic processes that lead to statistical applications.
Prerequisites: Minimum grades of C- in STAT 265, STAT 151 or STAT 161, and in either CMPT 101 or CMPT 103.

STAT 312
Probability Theory II
3 Credits Weekly (3-0-0)
This course offers a rigorous approach to probability theory. Topics covered include concepts of probability theory, multivariate random variables, conditional expectation and variance, probability and moment generating functions, the multivariate normal distribution, different types of convergence and limit theorems, Poisson and branching processes.
Prerequisites: Minimum grades of C- in MATH 215, MATH 225, and STAT 265.

STAT 322
Finite Markov Chains and Applications
3 Credits Weekly (3-0-1)
This course presents fundamental results regarding finite Markov chains. Topics covered include connection with matrix theory, classification of states, main properties of absorbing, regular and ergodic finite Markov chains. Applications to genetics, psychology, computing science and engineering are also included.
Prerequisites: Minimum grades of C- in either MATH 120 or MATH 125, and in STAT 265; a minimum grade of C- in Math 214 is recommended.

STAT 324
Computational Statistics with R
3 Credits Weekly (2-2-0)
This course explores the usage of computer programming and algorithms in the field of statistics. The focus of the course will be computationally intensive statistical methods, such as Monte Carlo simulations, the expectation-maximization algorithm, and bootstrapping. The material will be illustrated and the students' work will be carried out using R (a free, open source, multi-platform programming language).
Prerequisites: Minimum grades of C- in STAT 266, and in either CMPT 101 or CMPT 103.

STAT 350
Sampling Theory and Applications
3 Credits Weekly (3-0-0)
This course concentrates on the design and analysis techniques for sample surveys. Topics include simple random sampling, stratified sampling, ratio, regression and difference estimation, single-stage cluster sampling, systematic sampling, two-stage cluster sampling.
Prerequisites: A minimum grade of C- in STAT 265.

STAT 353
Design and Analysis of Experiments
3 Credits Weekly (3-2-0)
This course deals with design, conduct and analysis of experimental studies. Topics include: principles of design, completely randomized design with one factor, randomized complete block designs, Latin square design, Graeco-Latin square design, balanced incomplete block design, factorial design, two-level factorial design, two-level factorial design in incomplete blocks, two-level fractional factorial design, experiments with random factors, and nested and split-plot designs.
Prerequisites: A minimum grade of C- in STAT 266.

STAT 370
Applied Time Series Analysis
3 Credits Weekly (3-2-0)
This is an introductory course in applied time series analysis. Topics include computational techniques in time domain for simple time series models. Model selection, estimation, and forecasting are illustrated for the autoregressive, moving average, ARMA, ARIMA and SARIMA models. Applications are taken from medical and social sciences, biology, engineering and business.
Prerequisites: Minimum grades of C- in STAT 266, MATH 214, and MATH 225.

STAT 371
Applied Categorical Data Analysis
3 Credits Weekly (3-2-0)
This course presents fundamental methods in categorical data analysis emphasizing applications. Topics include: analysis of two-way tables, models for binary response variables, loglinear models, and models for ordinal data and multinomial response data.
Prerequisites: A minimum grade of C- in either STAT 252 or STAT 266.

STAT 372
Applied Multivariate Statistics and Machine Learning
3 Credits Weekly (3-2-0)
This course focuses on essential multivariate statistical methods. Topics include matrix algebra, tests of significance, principal components analysis, factor analysis, discriminant analysis, cluster analysis and canonical correlation analysis. This course is relevant to working professionals in health, social biological and behavioral sciences who engage in applied research in their field.
Prerequisites: Minimum grades of C- in STAT 265, one of MATH 120 or MATH 125, and one of STAT 151 or STAT 161.

STAT 378
Applied Regression Analysis
3 Credits Weekly (3-2-0)
The course introduces methods in regression analysis. Topics include: multiple linear regression with particular focus on diagnostics, non-linear regression, and generalized linear models, such as Poisson regression and logistic regression. Emphasis will be placed on the practical application of the statistical methods.
Prerequisites: Minimum grades of C- in either STAT 266 or in all of STAT 252, MATH 114, and either MATH 120 or MATH 125.

STAT 395
Special Topics in Statistics at the intermediate level
3 Credits Weekly (3-0-1)
In this course students examine a topic in Statistics at the intermediate level. Topics vary and are announced prior to registration. Consult with faculty members in Statistics for details regarding current offerings. Note: This course may be taken multiple times for credit.
Prerequisites: A minimum grade of B- in STAT 265 and consent of the department.

STAT 398
Independent Study
3 Credits Total (0-0-45)
This course permits an intermediate-level student to work with an instructor to explore a specific topic in depth through research or directed reading in primary and secondary sources. The student plans, executes and reports the results of their independent research or study project under the direction of a faculty supervisor. To be granted enrollment in the course, the student must have made prior arrangements with a faculty member willing to supervise his or her project. This course can be taken twice for credit.
Prerequisites: Consent of the Department.

STAT 412
Stochastic Processes
3 Credits Weekly (3-2-0)
This course presents fundamental results regarding discrete and continuous time Markov chains, branching processes, random walks, birth and death processes, semi-Markov processes, and Brownian motions. A practical but rigorous approach to stochastic processes will be utilized, with a focus on building models and understanding them mathematically.
Prerequisites: Minimum grades of C- in CMPT 101 or CMPT 103, MATH 214, MATH 225, STAT 266, and an additional three credits in any 300-level STAT *(*p. 1*) course.*

STAT 465
Probability Theory and Mathematical Statistics II
3 Credits Weekly (3-1-0)
This course offers a rigorous approach to probability theory and mathematical statistics. Topics include conditional expectation and variance, multivariate normal distribution, convergence, laws of large numbers, central limit theorem, maximum likelihood estimator and its properties, Delta method, likelihood ratio tests, Taylor and Edgeworth expansions.
Prerequisites: A minimum grade of C- in Math 225, STAT 266 and any 300-level statistics course.

STAT 478
Applied Generalized Linear Models
3 Credits Weekly (3-2-0)
The course introduces the theory of generalized linear models and their applications. Topics include exponential family of distributions, modeling binomial and count data, linear mixed models, gamma and inverse-Gaussian generalized linear models, and introduction to survival analysis. Emphasis will be placed on the practical application of the statistical methods.
Prerequisites: A minimum grade of C- in both STAT 266 and STAT 378.

STAT 495
Special Topics in Statistics
3 Credits Weekly (3-0-1)
In this course, students examine an advanced topic in Statistics. Topics vary and are announced prior to registration. Consult with faculty members in Statistics for details regarding current offerings. Note: This course may up to three times for credit provided the topic is different.
Prerequisites: Minimum grade of B- in a 300-level STAT *(*p. 1*) course and consent of the department.*

STAT 496
Statistical Consulting Project
3 Credits Total (0-0-45)
The aim of the course is to provide students with experience in statistical consultation. Students are assigned to research projects as consultants, which requires them to consider ethical statistical practice, choose the appropriate statistical technique, and communicate the results to a non-mathematical audience.
Prerequisites: A minimum grade of C- in two 300-level STAT *(*p. 1*) courses and consent of the department.*

STAT 498
Advanced Independent Study
3 Credits Total (0-0-45)
This course permits senior-level students to work with an instructor to explore a specific topic in depth through research or directed reading in primary and secondary sources. The student plans, executes and reports the results of their independent research or study project under the direction of a faculty supervisor. To be granted enrollment in the course, the student must have made prior arrangements with a faculty member willing to supervise his or her project. This course can be taken twice for credit.

STAT 499
Honours Thesis
3 Credits Total (0-0-45)
Under the direction of a faculty supervisor, registered students explore a specific topic in depth through research or directed reading. The student plans, executes, and reports the results of their independent research or study project under the direction of a faculty supervisor in a written Honours Thesis with oral defense. Note: This course is intended for students in the final year of their degree and is open only to students in the Applied Statistics Honours program.
Prerequisites: Consent of the Department.