2022-2023
Applied Statistical Methods
STAT 1000--4 Credits

Description: This course teaches methods of descriptive and inferential statistics. Topics include data collection and description, hypothesis testing, correlation and regression, the analysis of variance, chi-square tests. Students will learn how to use the statistical computer package Minitab.

Prerequisite: Two years of high school algebra are recommended.

Grading: The grade is determined by the student's performance on a mid-term exam, a comprehensive final, and other assessments as determined by the teacher (homework, unit tests, projects, etc.).

Textbook: The recommended textbook is *Introduction to the Practice of Statistics*, 9th ed., by David S. Moore, George P. McCabe, and Bruce A. Craig. *The Practice of Statistics*, 6th ed., by Daren S. Starnes and Josh Tabor is also an acceptable textbook. Earlier editions of both textbooks are acceptable. Alternate textbooks may be considered but must first be approved by the faculty liaison.

The following topics are covered in the University of Pittsburgh STAT 1000 course. The statistical package MINITAB is used for all topics below:

1. **Introduction:** What is statistics? Variable types, populations, parameters, samples, statistics, sampling methods (simple random sample, stratified random sample, etc.)
2. **Data Collection:** Surveys, observational studies, experiments
3. **Experimental Design:** Completely randomized design, block design, factorial design, ethics in experiments
4. **Descriptive Statistics (Categorical):** Bar graphs, pie charts, side-by-side bar graphs, proportion, conditional proportion
5. **Descriptive Statistics (Quantitative):** Histograms (shape and modality), boxplots (including side-by-side boxplots), mean, median, standard deviation, percentiles, range, interquartile range, five number summary, outliers
6. **Association and Regression:** Scatterplots (including outliers, high leverage points, and influential points), correlation, coefficient of determination (R-squared), regression line (making predictions, interpreting slope and intercept), residuals
7. **Probability:** Basic probability rules (addition rules, multiplication rules, compliment rule), probability trees, Bayes' Rule, independence, disjoint events
8. **Probability Distributions:** Random variables, rules for means and standard deviations, binomial distribution, normal distribution (finding probabilities and percentiles, sum and difference of normal random variables, normal probability plot)

9. **Sampling Distributions (for Means and Proportions**): Law of Large Numbers, Central Limit Theorem, mean and standard error, standardizing sample means and proportions, hands-on or computer simulations of sampling distributions

10. **Confidence Intervals for Means (Known Population Standard Deviation):** Constructing confidence intervals from data, simulations to illustrate concept, impact of different confidence level, standard deviation, and sample size

11. **Hypothesis Tests for Means (Known Population Standard Deviation):** Null and alternative hypotheses, test statistic, calculating p-values, critical values, level of significance, Type I, and Type II error, relationship to confidence intervals, calculation and interpretation of statistical power

12. Inference for Population Proportion: Hypothesis tests and confidence intervals, sample size calculations

13. **Inference for Population Means (One Sample, Matched Pairs, Two-Sample):** t-distribution, comparison to standard normal distribution, degrees of freedom, using t-tables to find critical values for confidence intervals and hypothesis tests, interpreting computer output, pooled and unpooled two-sample tests, comparison of paired and unpaired tests

14. **Chi-Square Tests:** Chi-squared distribution, goodness of fit test, test for independence, analyzing standardized residuals and chi-squared components (for both tests), identifying specific relationships (for test for independence)

15. **Analysis of Variance:** F-distribution and degrees of freedom, between group and within group variance, ANOVA table, multiple comparisons (either Fisher's LSD or Bonferroni method)

16. **Inference for Regression:** Interpreting and differentiating between residual standard deviation and standard error of the slope, testing the slope (hypothesis test and confidence interval), checking error term conditions (homoscedasticity and normality), extrapolation, confidence intervals and prediction intervals on regression line

Additional course credit information for STAT 1000:

At the University of Pittsburgh:
- Majors: This is a course that will fulfill a prerequisite for most math and science related majors. This course will not fulfill the requirement for the School of Engineering as they have their own statistics course. It also will not satisfy the prerequisite for the College of Business Administration as STAT 1100 is the required course
- Electives: Individual Schools and Colleges of the University have different policies about elective credits and may count this course as an elective. Students interested in studying at the University of Pittsburgh should contact their School/College of interest to see if this course would be counted
- Graduation: This course's credits count toward the number of credits needed for graduation

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Academic Integrity: All College in High School teachers, students, and their parents/guardians are required to review and be familiar with the University of Pittsburgh's Academic Integrity Policy located online at https://www.as.pitt.edu/faculty/policies-and-procedures/academic-integrity-code.

Grades: Grade criteria in the high school course may differ slightly from University of Pittsburgh standards. A CHS student could receive two course grades: one for high school and one for the University transcript. In most cases the grades are the same. These grading standards are explained at the beginning of each course.

Transfer Credit: University of Pittsburgh grades earned in CHS courses appear on an official University of Pittsburgh transcript, and the course credits are likely to be eligible for transfer to other colleges and universities. Students are encouraged to contact potential colleges and universities in advance to ensure their CHS credits would be accepted. If students decide to attend any University of Pittsburgh campuses, the University of Pittsburgh grade earned in the course will count toward the student grade point average at the University. At the University of Pittsburgh, the CHS course supersedes any equivalent AP credit.

Drops and Withdrawals: Students should monitor progress in a course. CHS teacher can obtain a Course Drop/Withdrawal Request form from the CHS office or Aspire. The form must be completed by the student, teacher and parent/guardian and returned to teacher by deadlines listed. Dropping and withdrawing from the CHS course has no effect on enrollment in the high school credits for the course.