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# *Advanced Statistics Syllabus*

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## Class Expectations

- Letter of expectation

- Bloom's Taxonomy

## Introduction to Data

- Types of Data

- Categorical – Qualitative, Nominal

- Numerical – Quantitative

- Ordinal

- Interval

- Ratio

## Descriptive Statistics

- Descriptive words

- Symmetric

- Skewed

- Mound Shaped

- Numeric Descriptions

- Measures of Central tendency - Mean, Median, Mode

- Measures of Location – Percentiles, Quartiles

- Measures of Spread – Range, Interquartile Range, Variation, Standard Deviation

- 5 number summary, modified box plot, degrees of freedom

## Graphs

- Circle Graphs

- Bar Charts

- Stem-and-Leaf

- Dot Plots

- Histograms

- Frequency Graph

- Relative Frequency

- Box and Whisker

- Outliers

- Time Series

# *Advanced Statistics Syllabus*

## **Introduction to Probability**

- Counting Principles
  - Permutation
  - Combinations
  - Tree Diagrams
  - Pascal's Triangle
- Simple events
- Compound events
- Independence
- Venn Diagrams

## **Introduction to Distributions**

- Random, discrete, continuous variables
- Sum, differences, linear transformations of means, sum of variances
- Density curves
  - Constant
  - Binomial
  - Geometric
  - Normal
    - Z scores
    - 68,95,98.7 rule
    - N( ) tables, pdfnormal, cdfnormal, invnorm

## **Introduction to Data Collection**

- Introduction to data collection
- Introduction to sampling
  - Random numbers
  - Random digit table
  - Excel, MiniTab
  - Convenience
  - Judgement
  - SLOPS
  - Simple Random Sample
  - Stratified Random Sample
  - Cluster Sample
- Introduction to Surveys
  - Sampling Errors
  - Non-Sampling Errors
  - Margin of error
- Experiments, experimental design
  - Blocked design
  - Matched Pair, Pre-Test Post-Test
- Simulation

## **Sample Distributions**

Central Limit Theorem  
Sampling distribution of the Mean  
    Assumptions regarding normalcy  
    Normally Distributed Population  
    Uniformly Distributed Population  
    Exponentially Distributed Population  
    Discretely Distributed Population  
Sampling Distribution of Proportion  
Statistical Process Control – Control Chart

## **Estimation**

Confidence Interval for Mean – Large Samples  
Confidence Intervals for Mean – Sigma unknown  
Interpreting the Confidence Interval  
Sample Size to estimate the Mean  
Confidence Interval for Proportion  
Sample Size for estimating the proportion  
Confidence Intervals for Mean – Small samples  
Considerations for large samples

## **Hypothesis Tests**

Hypothesis Tests  
    Null and Alternate hypothesis  
    Condition and Assumptions  
    Rejection Region  
    Error Types Defined  
    Test Statistic  
    Conclusions  
    T-Scores  
Difference of Means  
Difference of 2 Means independent samples  
Hypothesis test of Proportions  
Hypothesis test for difference of Proportions  
Power of a Test

## *Advanced Statistics Syllabus*

### **Chi Square test**

- Goodness of Fit
- Test of Independence
- Test of Homogeneity

### **Bivariate Relationships and Regression**

- Introduction to bivariate data
- Correlation Coefficient and Coefficient of Determination
- Med-Med Line
- Least Squares Regression Line
  - Residuals
  - Influential points, outliers
- Non-Linear relationships and transformations
- Estimating Variance of the linear regression
- Confidence Intervals for the slope
- Hypothesis Testing for existence of the linear relationship
- Using the regression line as a predictor
  - Prediction interval
  - Confidence Interval

### **Appendix**

Tables