

# MATHEMATICAL STATISTICS – First Semester – Prof. Richard B. Goldstein

## [1] INTRODUCTION

- [A] Population, sample, qualitative/categorical (nominal), quantitative (ordinal, interval, ratio)
- [B] Sampling – random, stratified, systematic, cluster, convenience

## [2] ORGANIZING & DISPLAYING DATA

- [A] Tallying, how many intervals?, class widths
- [B] Histograms, frequency polygons, cumulative frequency/ogive
- [C] Stem and leaf displays

## [3] DESCRIPTIVE STATISTICS

- [A] Sample Data
  - [i] mean, mode, median, trimmed mean, geometric mean, harmonic mean, weighted mean
  - [ii] variance, standard deviation, range, mean absolute deviation
  - [iii] higher moments – skewness, kurtosis
  - [iv] percentiles
  - [v] box & whisker plots, outliers
- [B] Grouped Data

## [4] PROBABILITY

- [A] Sample space, events, probability of an event, additive rules, conditional probability, tree diagrams
- [B] factorial, permutation, combination, Bayes' Rule

## [5] DISCRETE DISTRIBUTIONS

- [A] mean, variance, etc., two variables - covariance
- [B] binomial, Poisson, geometric, hyper-geometric, negative binomial, multinomial

## [6] CONTINUOUS DISTRIBUTIONS

- [A] mean, variance, etc.
- [B] Uniform, Normal/Gauss, Gamma, exponential, Chi-Squared, Lognormal, Pearson & Johnson systems

## [7] SAMPLING DISTRIBUTIONS

- [A] Sample distribution of the mean
- [B] Sample distribution of variance
- [C] t and F distributions

[8] ONE & TWO SAMPLE ESTIMATION

- [A] Classical estimation methods
- [B] Estimating the mean
- [C] Confidence intervals
- [D] Difference of two means
- [E] Proportions
- [F] Difference between two proportions
- [G] Variance
- [H] Ratio of two variances

[9] ONE & TWO SAMPLE TESTS OF HYPOTHESES

- [A] General concepts, one & two tailed tests, p-values
- [B] Single mean – variance known or unknown
- [C] Two means
- [D] Single proportion
- [E] Two proportions
- [F] Variances – one and two sample
- [G] Goodness-of-fit
- [H] Testing for normality
- [I] Tests for independence and homogeneity
- [J] Several proportions