

S.U. DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
SYLLABUS (Tentative)
HONR 212-042 *Issues in the Natural Sciences: Statistics through Baseball*

- Objective:** In general, to introduce students to the role of mathematics in culture. Specifically in this offering, to introduce students to the concepts of probability and statistics by means of playing with baseball statistics.
- Intended for:** Students whose major areas of study do not have specific requirements in mathematics, who want to learn elementary probability and statistics, and who have an interest in baseball.
- Prerequisite:** Three years of high-school mathematics, including geometry, or intermediate algebra at a college or university.
- Text:** *Teaching Statistics Using Baseball*, by Jim Albert; The Mathematical Association of America, 2003.
- Reference:** A book of statistical formulas. My preferred one is *A First Course in Statistics* (any edition), by McClave and Sincich (Prentice Hall). Less valuable but acceptable is *CliffsQuickReview Statistics*, by Voelker, Orton, and Adams (Wiley Publishing, 2001).

<u>Topic</u>	<u>Weeks</u>
<i>An Introduction to Baseball Statistics</i>	2
Mathematical preliminaries: sets and functions. Probabilistic preliminaries: frequency- and probability-distributions. Statistical preliminaries: populations and samples, physical and statistical. Baseball preliminaries: basic measures of performance, and their relation to common statistical measures.	
<i>Exploring a Single Batch of Baseball Data</i>	2
Teams' offensive statistics: stem-and-leaf displays and the Five-Number Summary. A tribute to Cal Ripken: dotplots, time-series plots, and curve-fitting. A tribute to Roger Clemens: summary statistics and comparison of distributions. Analyzing baseball attendance: histograms. The use of sacrifice-bunts: more comparing of distributions.	
<i>Comparing Batches and Standardization</i>	1
"Slugging percentages are normal": normal probability distributions. Great batting averages and standardized scores.	
<i>Introduction to Probability Using Tabletop Games</i>	2
"What is Barry Bonds's home-run probability?": the relative-frequency interpretation of probability and the Law of Large Numbers. Big-league baseball: sample spaces, equiprobable outcomes. All-Star baseball: probability as area, multinomial experiments. Strat-O-Matic Baseball: theorems of probability; conditional probability.	
<i>Probability Distributions and Baseball</i>	2
Binomial distributions and hits per game: binomial probabilities, independence, expected counts, and simulation. Modeling runs scored: Negative-binomial distributions and Pearson Residuals.	
<i>Introduction to Statistical Inference</i>	2
Ability and performance. Simulating a batter's performance: Bernoulli Trials, Bayes's Rule. Interval-estimates for ability: confidence-intervals; subjective probability. Comparing Wade Boggs and Tony Gwynn: confidence-interval estimates for proportions, time-series plots.	
<i>Topics in Statistical Inference</i>	2
Observed situational effects for many players. Modeling batting averages for many players: Normal distributions.	
<i>Optional topics, as time permits</i>	1
Relationships between sets of measurements. A new measure of offensive performance. Are batting slumps inevitable? Are seven-game playoff series fairer than five-game ones? Modeling baseball with Markov Chains.	
<i>"The Fourth Credit" (Enhancement)</i>	
<i>Baseball</i> , the award-winning Ken Burns documentary shown on the Public Broadcasting Service television network, will be viewed by the students and discussed in class.	14

EVALUATION

Homework and class-participation	30 - 70%
Midterm Examination	0 - 20%
Project	30 - 70%
Final Examination	0 - 20%