SU DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
SYLLABUS (Tentative)
MATH 105 ***Liberal-Arts Mathematics: Statistics through Baseball***

Objective: In general, to introduce students to the role of mathematics in culture. Specifically in this offering, to explore the concepts of probability and statistics through the lens of baseball.

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 (MATH 100).

Text: *Teaching Statistics Using Baseball*, by Jim Albert; The Mathematical Association of America. 10th Edition.

Reference: *A First Course in Statistics* (any edition from the eighth on), by James T. McClave and Terry Sincich (Prentice Hall).

Topic	**Weeks**
An Introduction to Baseball Statistics Mathematical fundamentals: sets and functions. Probabilistic fundamentals: frequency- and probability-distributions. Statistical fundamentals: populations and samples, means and proportions. Baseball fundamentals: basic measures of performance, and their relation to common statistical measures.	2
Exploring a Single Batch of Baseball Data 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 Greg Maddux or Randy Johnson; summary statistics and comparison of distributions. Analyzing baseball attendance: histograms. The use of sacrifice-bunts: comparing distributions.	2
Comparing Batches and Standardization "Slugging percentages are normal": normal probability distributions. Great batting averages and standardized scores. Does Tom Glavine or Vladimir Guerrero deserve to be in baseball's Hall of Fame?	1
Introduction to Probability Using Tabletop Games "What was 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.	2
Probability Distributions and Baseball Binomial distributions and hits per game: binomial probabilities, independence, expected counts, and simulation. Modeling runs scored: Negative-binomial distributions and Pearson Residuals.	2
Introduction to Statistical Inference Ability and performance. Simulating a batter's performance: Bernoulli Trials, Bayes' Rule. Intervalestimates for ability: confidence-intervals; subjective probability. Comparing Wade Boggs and Tony Gwynn: confidence-interval estimates for proportions, time-series plots.	2
Topics in Statistical Inference Observed situational effects for many players. Modeling batting averages for many players: normal distributions.	2
Optional topics, as time permits 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.	1
"The Fourth Credit" *Baseball*, the award-winning 27-hour Ken Burns documentary shown on the Public Broadcasting Service television network, will be viewed by the students and discussed in class.	
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EVALUATION
Homework and class-participation 30 - 70%
Midterm Examination 0 - 20%
Project 30 - 70%
Final Examination 0 - 20%