Course Syllabus Format
Southeast Missouri State University

Department of Mathematics
Course No. MA423/623
Title of Course: Statistical Analysis for Forensic Science
New Course

I. Catalog Description and Credit Hours of Course:
   Introduction to the statistical analysis of genetic data used in forensic science. Basic probability distributions used in analyzing genetic data will be discussed. Emphasis will be placed on estimation and statistical inferential procedures employed in forensic science. 3 credit hours.

II. Prerequisite: MA 140 Analytic Geometry and Calculus I or consent of instructor

III. Purposes or Objectives of the Course:
   A. Perform statistical tests on genetic data.
   B. Use tools in probability and statistics to analyze cases involving genetic and forensic data.

IV. Expectations of Students:
   A. Students are expected to perform statistical analysis on real-life data that are prevalent in forensic science with the help of a statistical software.
   B. Students are required to use probability and statistics in making appropriate conclusions on case studies involving genetic data.

V. Course Content or Outline (Indicate number of class hours per unit or section):
   A. Introduction to Probability and Some Basic Distributions – 13 hours
      1. Laws of Probability, conditional probability and Bayes theorem: paternity index
      2. Properties of random variables
      3. Discrete distributions: binomial and multinomial distributions
      4. Continuous distributions: normal, chi-square, F, beta and Dirichlet distributions
   B. Estimation – 10 hours
      1. Statistical sampling and graphical summaries
      2. Desirable properties of an estimator
      3. Method of moments estimation
      4. Maximum likelihood estimation
      5. Confidence interval estimation
   C. Statistical Inference – 22 hours
      1. Hypothesis testing
      2. Likelihood ratio tests: Hardy Weinberg equilibrium, forensic testing
      3. Log-linear models: locus models
      4. Chi-square tests: linkage disequilibrium
      5. Analysis of variance: heterozygosity, allele frequency

VI. Textbook(s) and/or Other Required Materials or Equipment:
   A. Textbook: Genetic Data Analysis II by Bruce S. Weir
   B. Other References: Probability and Statistical Inference by Robert Hogg and Elliot Tanis and Applied Categorical Analysis by Daniel Freeman
   C. Statistical Software: SAS or SPSS

VII. Basis for Student Evaluation
   A. Two In-Class Examinations (20% each, for a total of 40%)
   B. Problem Sets and Quizzes (20%)
   C. Class Projects (20%) – Graduate students are required to complete at least one more project. This additional work will constitute a significant portion of the 20% credit.
   D. Comprehensive Final Examination (20%)