STATE UNIVERSITY COLLEGE AT BUFFALO

Department of Mathematics

Request for Course

I. NUMBER AND TITLE:

MAT 325   Probability and Statistics

II. REASONS FOR ADDITION:

The course will serve the following purposes in our program:

A. This course is for mathematics education majors, who need to understand the fundamentals of the theory and applications of both probability and statistics. Presently no single course that covers both probability and statistics exists in our program. NCATE has cited this deficiency as a programmatic weakness.

B: To provide an integrated course in Probability and Statistics for the mathematics education program that will cover the breadth necessary to teach the new NYSED curriculum standards and provide the background necessary for the NYSED Content Specialty Test in mathematics.

III. MAJOR OBJECTIVES:

A. Students will utilize methods of descriptive statistics to make inferences from a set of data.

B. Students will demonstrate an understanding of the principles, properties and techniques of probability and its applications.

C. Students will demonstrate an understanding of the principles, properties and techniques of statistical inference and its applications.

D. Students will understand the relationship between the fundamentals of probability and of statistics to make decisions in the face of uncertainty.

E. Students will be able to use such software as MINITAB, SPSS, and MATHEMATICA, as well as such instruments as graphing calculators, as tools for exploration.

IV. TOPICAL OUTLINE:

A. Descriptive statistics

    1. Populations and samples

    2. Parameters and statistics

    3. Measures of central tendency (Mean, Median, Mode) and variation (Range, Variance, Standard Deviation)

    4. Chebyshev's theorem

    5. Z-Scores

    6. Frequency distributions and histograms

    7. Scattergrams, Stem and leaf plots, Box and Whisker diagrams

    8. Measures of position (Percentiles, Deciles and Quartiles)

B. Probability

    1. Sample spaces and events including tree and Venn diagrams

    2. Counting principles such as permutations, combinations, binomial expansion

    3. Conditional probability

    4. Complementary, additive and multiplicative rules of probability

C. Probability distributions

    1. Random variable

    2. Discrete and continuous probability distributions

    3. Mean and variance of a random variable

    4. Bernoulli, Binomial and Poisson distributions

    5. Normal distribution

    6. Normal approximation to the binomial distribution

D. Inferential Statistics

    1. Central limit theorem

    2. t-distribution and Chi-Square distribution

    3. Point estimation

    4. Interval estimation of means and proportions

    5. Tests of hypotheses concerning means and proportions

    6. Interval estimation of variance and standard deviation

    7. Tests of hypotheses concerning variance and standard deviation

    8. Estimating the difference between two means or proportions

    9. Testing the difference between two means or proportions

E. Applied Statistics

    1. Chi-square tests for goodness of fit and independence

    2. F-distribution and Analysis of Variance (ANOVA)

    3. Correlation

    4. Regression

    5. Nonparametric statistics

F. Statistics-Related Software and Technology

    1. MINITAB

    2. SPSS

    3. MATHEMATICA

    4. Graphing Calculators

V. BIBLIOGRAPHY:

A. Books

Berry, D.A., Lindgren, B.W. <u>Statistics: Theory and Methods</u>, 2nd edition. Pacific Grove, CA: Brooks/Cole, 1996.

Casella, G., Berger, R.L. <u>Statistical Inference</u>, 2nd edition. Pacific Grove, CA: Duxbury Press, 2002.

Degroot, M.H., Schervish, M.J. <u>Probability and Statistics</u>, 3rd edition. Reading, MA: Addison Wesley, 2002.

Devore, J.L, Peck, R. <u>Introductory Statistics</u>. St. Paul, MN: West Publishing, 2001.

Devore, J.L., Peck, R. <u>Statistics: The Exploration and Analysis of Data</u>, 4th edition. Pacific Grove, CA: Duxbury Press, 2001.

Freund, J.E., Perles, B.M. <u>Statistics: A First Course</u>, 7th edition. Englewood Cliffs, NJ: Prentice Hall, 1999.

Freund, J.E., Perles, G.A. <u>Modern Elementary Statistics</u>, 10th edition. Englewood Cliffs, NJ: Prentice Hall, 2001.

Helms, L.L. <u>Introduction to Probability Theory</u>. New York, NY: W.H. Freeman, 1997.

Hogg, R.V., Tanis, E.A. <u>Probability and Statistical Inference</u> (6th edition). Englewood Cliffs, NJ: Prentice Hall, 2001.

Johnson, R.A., Bhattacharyya, G.K <u>Statistics: Principles and Methods</u>, 4th edition. New York, NY: John Wiley and Sons, 2001.

Johnson, R.R., Kuby, P.T. <u>Elementary Statistics</u>, 8th edition. Pacific Grove, CA: Duxbury Press, 2000.

Larsen, R.J., Marx, M.L. <u>Introduction to Mathematical Statistics and its Applications</u>, 3rd edition. Englewood Cliffs, NJ: Prentice Hall, 2001.

Mendenhall, W., Beaver, R., Beaver, B.M. <u>Introduction to Probability and Statistics</u>, 10th edition. Boston, MA: PWS, Kent, 1999.

Moore, D.S., McCabe, G.P. <u>Introduction to the Practice of Statistics</u>, 4nd edition. New York, NY: W.H. Freeman, 2002.

Ott, L., Mendenhall W. Understanding Statistics, 6th edition. Pacific Grove, CA: Duxbury Press, 1994.

Ott, R.L., Longnecker, M.T. An Introduction to Statistical Methods and Data Analysis, 5th edition. Pacific Grove, CA: Duxbury Press, 2001.

Rice, J.A. Mathematical Statistics and Data Analysis, 2nd edition. Belmont. CA: Wadsworth, 1995.

Stone, C.J. A Course in Probability and Statistics, 1st edition. Pacific Grove, CA: Duxbury Press, 1996.

Triola, M.F. Essentials of Statistics, 8th edition. Reading, MA: Addison Wesley, 2002.

Wackerly, D., Mendenhall, W., Scheaffer, R.L. Mathematical Statistics with Applications, 6th edition. Pacific Grove, CA: Duxbury Press, 2002.

Weiss, N.A. Elementary Statistics, 5nd edition. Reading, MA: Addison Wesley, 2002.

Weiss, N.A. Introductory Statistics, 6rd edition. Reading MA: Addison Wesley, 2002.

B. Journals

The American Statistician

The Annals of Probability

The Annals of Statistics

Bernoulli (Journal of the Bernoulli Society for Mathematical Statistics and Probability)

The Mathematics Teacher (NCTM Publication)

VI. PRESENTATION AND EVALUATION:

Lectures, class discussions, assigned readings, assigned problems, and oral presentations. Evaluation by written examination and/or oral examinations or portfolios.

VII. PREREQUISITES:

MAT 162, MAT 163, MAT 164, MAT 270 and 0721 major; or permission of instructor.

VIII. CREDIT:

(3: 0)

IX. STATEMENT OF APPROVAL:

This course proposal was examined in accord with recommended procedures and was approved by the Department of Mathematics on _____

_____(Department Chairperson)

X. CATALOG DESCRIPTION:

Probability (graphic representations, descriptions of probabilistic events, combinatorics and combinatorial probability), discrete and continuous probability distributions, descriptive statistics, estimation and tests of hypotheses concerning means, proportions, variance and standard deviation and differences between means and proportions, Chi-Square tests for goodness of fit and independence, F-distribution and Analysis of Variance, correlation and regression, non-parametric statistics.

XI. STATEMENT OF QUALIFICATIONS OF FACULTY WHO WILL TEACH THE COURSE:

A. General Faculty Qualifications

Minimum of a Masters Degree in Mathematics, Statistics or a related area.

B. List of faculty members who will teach the course

J. Slivka Ph. D., and C. Ghosh Ph. D..

XII. SUPPORT SERVICES REQUIRED:

Present classroom facilities are adequate.