NORMANDALE COMMUNITY COLLEGE **4/24/2012**
COMMON COURSE OUTLINE
MATHEMATICS 2400 - PROBABILITY AND STATISTICS WITH CALCULUS

I. EFFECTIVE DATE OF OUTLINE

Fall Semester, 2010. To be reviewed by the department annually.

II. CATALOG DESCRIPTION

A. MATH 2400
B. Probability and Statistics with Calculus
C. 4 Credits
D. Offered Fall and Spring Semesters
E. Prerequisite: MATH 1520 with a grade of C or higher or approved equivalent preparation.
F. Descriptive statistics, elementary probability and probability distributions, sampling and the elements of statistical inference including point/interval estimation and hypothesis tests. Satisfies MnTC Goal 4.

III. RECOMMENDED ENTRY SKILLS/KNOWLEDGE

Students are expected to have mastered and retained the material covered in a standard first-year calculus sequence. This includes familiarity with graphs of algebraic, exponential, and logarithmic functions; facility with limits, derivatives, max-min problems, and the basic techniques of integration (e.g. substitution and parts) for finding areas beneath curves.

IV. OUTLINE OF MAJOR CONTENT AREAS

A. Summaries of data - frequency tables, histograms, bar/pie charts, stem and leaf plots, box and whiskers plot
B. Numerical measures of central tendency/variability - mean, median, mode, variance, standard deviation, z-scores, and percentile rank
C. Axioms of probability theory, counting principles, complementary events, conditional probability, unions and intersections of events
D. Discrete probability distributions, e.g. binomial, multinomial, geometric, hypergeometric, negative binomial, and Poisson
E. Continuous probability distributions - uniform, normal, gamma, beta
F. Discrete bivariate distributions, independence, covariance and correlation
G. Sampling distributions, the central limit theorem, and the normal approximation to the binomial distribution
H. Confidence intervals for means, proportions, and their differences, variance
I. Elements of one and two sample hypothesis test
J. Additional topics may include regression, method of moments/maximum likelihood, ANOVA, and control charts

V. LEARNING OUTCOMES

After successful completion of MATH 2400, students will be able to: (Letters in parentheses refer to the student competencies of the Minnesota Transfer Curriculum, Goal 2–Critical Thinking, and Goal 4–Mathematical/Logical Reasoning.)

A. Compute mean, median, modes, standard deviation, z-scores and percentile ranks from data, and give simple common sense interpretations of these numerical measures. (4b)
B. Construct from raw data: frequency tables, histograms, pie charts, stem and leaf plots and estimate the common numerical measures from them. (2a; 4b)
C. Solve combinatorial problems involving permutations, combinations, and partitions. (4a, c, d)
D. Recognize underlying sample space structure in many applied situations and use this structure to compute probabilities of compound, complementary, and conditional events. (2a; 4d)
E. Compute expected values, variances, and probabilities for the more common discrete and continuous probability distributions including the binomial, multinomial, geometric, hypergeometric, negative binomial, Poisson, uniform, normal, gamma, and beta. (4c, d)
F. Model numerous applied situations with the probability distributions given in E. (4a, d)
G. Determine expected values, variance and independence from a bivariate probability distribution. (4c, d)
H. Apply the central limit theorem to estimate probabilities of sample sums and means falling in a specified range of values. (2a, c; 4a, d)
I. Approximate binomial probabilities using the normal distribution. (4a, d)
J. Compute and interpret confidence intervals for means, proportions, and their differences, variance, and ratio of variance. (2a, c; 4a, b, d)
K. Carry out one sample hypothesis test (z or t) for population means, proportions, paired data, and variance, including the formation of null/alternative and interpretation of p-value. (2a, c; 4a, b, d)

VI. METHODS USED FOR STUDENT EVALUATION OF LEARNING

The instructor will choose from among various evaluation techniques including – but not limited to – in-class testing, take-home testing, assignments, quizzes, attendance, group or individual projects, and research. The instructor will also choose a method for end-of-the-semester evaluation.

VII. SPECIAL INFORMATION

A TI-89 graphing calculator is recommended. A certain amount of time spent in the computer center outside of class may be necessary for the completion of any computer projects.