Course discipline/number/title: MATH 2350: Introduction to Mathematical Statistics

A.   CATALOG DESCRIPTION
1. Credits: 4
2. Hours/Week: 4
3. Prerequisites (Course discipline/number): MATH 1119 OR MATH 1127
4. Other requirements: None
5. MnTC Goals (if any): NA

B.   COURSE DESCRIPTION This course is an introduction to mathematical statistics. Topics will include probability, discrete and continuous random variables, estimation, hypothesis testing, and regression analysis. Computers and graphics calculators will be used extensively throughout the class in the classroom and computer lab setting. College level reading skills as demonstrated by completion of READ 0900 or equivalent placement score.

C.   DATE LAST REVISED (Month, year): November, 2020

D.   OUTLINE OF MAJOR CONTENT AREAS:
1. Statistical Terminology and Methodology
2. Measures of Center and Dispersion
3. Exploratory Data Analysis, including Hypothesis Testing with Z-tests, t-tests, Chi-Squared Tests, and F Tests
4. Univariate, Multivariate, and Polynomial Regression and Correlation
5. Simulation and Stochastic Processes
6. Probability, Combinatorics, Expected Value and Bayes Rule.
7. Probability Distributions, Expectations, and Variances, both Discrete and Continuous
8. Moments and Moment Generating Functions
9. Bayesian Prior and Posterior Distribution Analysis
10. Computerized Computation of Probability and Statistical Concepts

E.   LEARNING OUTCOMES (GENERAL): The student will be able to:
1. Identify the role of statistics in the analysis of data from engineering and the sciences.
2. Learn to utilize proper statistical terminology to convey the results of their analysis to others.
3. Calculate and interpret probability theory and then connect the role that probability plays in statistical inference.
4. Create, evaluate, and integrate graphical representations of data within statistical inference and analysis.
5. Set up, calculate, and interpret the results of:
    a) discrete probability distributions
    b) continuous probability distributions
    c) estimates using confidence intervals
    d) hypothesis test for given data sets
    e) categorical data analysis
    f) Analysis of Variance (ANOVA)
6. Utilize and interpret simulation models for stochastic processes
7. Define and apply Moments and the Moment Generating Function for probability distributions
8. Select, fit, and interpret linear, polynomial, and multiple regression models
9. Perform basic Bayesian analysis using Prior and Posterior distributions.
10. Utilize software and programming languages such as, but not limited to, Excel, Python, and R for statistical analysis.

F.   LEARNING OUTCOMES (MNTC): NA

G.   METHODS FOR EVALUATION OF STUDENT LEARNING: Methods may include but are not limited to:
1. Homework
2. Quizzes
3. Examinations

G.   METHODS FOR EVALUATION OF STUDENT LEARNING: Methods may include but are not limited to:
   4.   Computer laboratory Assignments
   5.   Group or Individual Projects

H.   RCTC CORE OUTCOME(S). This course contributes to meeting the following RCTC Core Outcome(s): Critical Thinking. Students will think systematically and explore information thoroughly before accepting or formulating a position or conclusion.

I.   SPECIAL INFORMATION (if any):
   1.   Students must have, either personal or RCTC facility, access to a computer for laboratory assignments.