NEW RIVER COMMUNITY COLLEGE
DUBLIN, VIRGINIA

COURSE PLAN

Course Number and Title:_____MTH 245 Statistics I /BUS 216 Statistics for Business_____

Prepared by: _____Math Faculty_____   _____Fall 2022_____
                                                                          (Date)

Approved by:___S. Tolbert-Hunsey___   _____Fall 2022_____
                        (Dean)   (Date)

I.   Course Description

MTH 245 Statistics. Presents an overview of statistics, including descriptive statistics, elementary probability, probability distributions, estimation, hypothesis testing, correlation, and linear regression. This is a Passport and UCGS transfer course.

Prerequisite: Placement or completion of MTH 154: Quantitative Reasoning or MTH 161: Precalculus I or equivalent with a grade of C or better. (Credit will not be awarded for both MTH 155: Statistical Reasoning and MTH 245: Statistics I.) Lecture: 3 hours per week.

BUS 216 Probability and Statistics for Business and Economics. Introduces methods of probability assessment and statistical inference. Includes data collection and presentation, descriptive statistics; basic probability concepts; discrete and continuous probability distributions; decision theory; sampling and estimation; and hypothesis testing. Emphasizes business and economic applications. Utilizes computer software as a tool for problems solving. Prerequisite: IST 117 and MTH 161, or MTH 154. (all with a grade of C or better)

II.   Introduction

This course is designed to develop the skills of probability and statistics which are needed in a variety of fields. BUS 216 is a part of the Business Administration degree program and both BUS 216 and MTH 245 will fit a general education statistics requirement as well as prepare students for a follow up course in probability or statistics.

III.   Student Learning Outcomes

On successful completion of this course, students should be able to:

A. Graphical and Numerical Data Analysis
     a. Identify the difference between qualitative, discrete quantitative, and continuous quantitative data.
     b. Construct and interpret graphical displays of data, including (but not limited to) frequency tables, box plots, line charts, histograms, and bar charts.

        c. Compute measures of center (mean, weighted mean, median, mode), measures of variation, (range, interquartile range, standard deviation, variance), and measures of position (percentiles, quartiles, standard scores).

        d. Apply the Empirical Rule

  B. Sampling/Experimental Design

        a. Recognize a representative sample and describe its importance.

        b. Identify methods of sampling.

        c. Explain the differences between observational studies and experiments.

        d. Recognize and explain the key concepts in experiments.

  C. Probability Concepts

        a. Describe the difference between relative frequency and theoretical probabilities and use each method to calculate probabilities of events.

        b. Determine whether two events are mutually exclusive or independent.

        c. Determine probabilities of composite events using the complement rule, the addition rule, and the multiplication rule.

        d. Apply the Law of Large Numbers.

        e. Distinguish between discrete and continuous random variables.

        f. Use the binomial, normal, and t distributions to calculate probabilities.

        g. Recognize or restate the Central Limit Theorem and use it as appropriate.

        h. Identify when the use of the normal distribution is appropriate.

        i. Identify when the t distribution is preferable to the normal distribution in statistical inference.

        j. Distinguish between the distribution of a random variable and the sampling distributions of its associated sample statistics.

        k. Identify the sampling distributions of the sample mean and the sample proportion and use them to make statistical inferences.

  D. Univariate Statistical Inference

        a. Explain the difference between point and interval estimates.

        b. Describe the concepts of best estimate and margin of error.

        c. Construct confidence intervals for population means and proportions.

        d. Interpret the confidence level associated with an interval estimate.

        e. Distinguish between a two-tailed, left-tailed, and right-tailed hypothesis tests.

        f. Conduct hypothesis tests for population means and proportions.

        g. Interpret the meaning of both rejecting and failing to reject the null hypothesis.

        h. Describe Type I and Type II errors in the context of specific hypothesis tests.

        i. Use a p-value to reach a conclusion in a hypothesis test.

        j. Identify the interrelationship between hypothesis tests and confidence intervals.

  E. Two-Sample Statistical Inference

        a. Construct and interpret a confidence interval for the difference between two population means where the samples are independent and the population variances are assumed unequal.

        b. Construct and interpret a confidence interval for the difference between two population means where the data consists of matched pairs.

        c. Conduct a hypothesis test for the equality of two population means where the samples are independent and the population variances are assumed unequal.

        d. Conduct a hypothesis test for the equality of two population means where the data consists of matched pairs.

  F. Correlation and Regression

        a. Analyze scatterplots for patterns, linearity, and influential points.

       b. Determine the equation of a least-squares regression line and interpret its slope and intercept.

       c. Calculate and interpret the correlation coefficient and the coefficient of determination.

       d. Conduct a hypothesis test for the presence of correlation.

G. Technology Application

       a. Construct statistical tables, charts, and graphs using appropriate technology.

       b. Calculate descriptive and inferential statistics using an appropriate statistical software package.

       c. Complete statistical project. Students are required to complete some form of semester project in their course that is worth a significant portion of the student's grade. This could be either an individual or group effort, and could be completed in stages through the semester or as a single, stand-alone exercise. As a minimum, the project should require students to manipulate and draw statistical inferences from a large, realistic data set using a statistical software package.

IV.   **General Education Student Learning Outcomes Included in Course**

General education at NRCC provides the educational foundation necessary to promote intellectual and personal development. Upon completing the associate degree, graduates will demonstrate competency in student learning outcomes in 1) civic engagement, 2) critical thinking, 3) professional readiness, 4) quantitative literacy, 5) scientific literacy, and 6) written communication.

This course includes the following general education student learning outcomes:

- Identify the problem or complex issue and its various parts.
- Identify central issues and assumptions of a problem or issue.
- Seek and evaluate the information needed to fully understand the problem or complex issue.
- Identify complexities of an issue, relevant perspectives and/or important relationships when taking a position on a complex issue or problem.
- Analyze various perspectives of a problem or complex issue in order to reach a well-reasoned conclusion or solution.
- Critically evaluate and integrate qualitative and/or quantitative evidence in written communication.
- Explain numerical information presented in mathematical forms (e.g., equations, graphs, diagrams, tables, words).
- Convert relevant information into various mathematical forms (e.g., equations, graphs, diagrams, tables, words).
- Accurately solve mathematical problems.
- Make judgements and draw relevant conclusions from quantitative analysis of data and predict future trends when appropriate.
- Use quantitative evidence to support a position or clarity a purpose in writing using appropriate language, symbolism, data, and graphs.
- Distinguish a scientific argument from a non-scientific argument.
- Use given empirical information to generate evidence-based conclusions.

V.   Instructional Methods

The instructional procedures will include lectures, discussions, in class work, homework, reviews and tests.

VI.   Instructional Materials

- **eText:** Introductory Statistics, Saylor Academy, 2012 It is not necessary to purchase the text. The online version is free.

  https://saylordotorg.github.io/text_introductory-statistics/
  https://www.saylor.org/site/textbooks/Introductory%20Statistics.pdf

- **Software:** MyOpenMath https://www.myopenmath.com/

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  Microsoft Excel which is available on all NRCC computers.

- **Calculator:** A calculator is REQUIRED. A scientific calculator is recommended. A graphing calculator *will not be permitted on tests or quizzes*.

- Note paper, graph paper, pencils etc. Submitted work should be neat, legible and preferably written in pencil.

VII.   Course Content

- Populations, parameters, samples and statistics
- Statistical graphs
- Probability and probability distributions
- Sampling distributions
- Estimation of parameters
- Two-Sample Statistical Inference
- Hypothesis tests for parameters
- Regression

VIII.   Evaluation

The grade for the course will be calculated from Tests, homework, a final exam and other work as deemed appropriate by the instructor. See individual syllabus for details on percentages/points.

IX.   Attendance

Regular attendance at classes is required. When absence from a class becomes necessary, it is the responsibility of the student to inform the instructor prior to the absence whenever possible. The student is responsible for the subsequent completion of all study missed during an absence. Any instruction missed and not subsequently completed will necessarily affect the grade of the student regardless of the reason for the absence.

X.   Cheating Policy

The giving or receiving of any help from another student or unauthorized individual on any graded portion of the course is considered cheating and will not be tolerated. The use of books, notes, electronic devices of any other unauthorized material during tests is considered cheating, and will not be tolerated. Any student found cheating will receive a grade of "0" on that assignment and may receive an "F" for the course. This "0" cannot be replaced by any other score. Mobile phones are not permitted to be used as calculators.

XI.   Withdrawal Policy

Student Initiated Withdrawal Policy

A student may drop or withdraw from a class without academic penalty during the first 60 percent of a session. For purposes of enrollment reporting, the following procedures apply:

a.   If a student withdraws from a class prior to the termination of the add/drop period for the session, the student will be removed from the class roll and no grade will be awarded.

b.   After the add/drop period, but prior to completion of 60 percent of a session, a student who withdraws from a class will be assigned a grade of "W." A grade of "W" implies that the student was making satisfactory progress in the class at the time of withdrawal, that the withdrawal was officially made before the deadline published in the college calendar, or that the student was administratively transferred to a different program.

c.   After that time, if a student withdraws from a class, a grade of "F" or "U" will be assigned. Exceptions to this policy may be made under documented mitigating circumstances if the student was passing the course at the last date of attendance.

A retroactive grade of "W" may be awarded only if the student would have been eligible under the previously stated policy to receive a "W" on the last date of class attendance. The last date of attendance for a distance education course will be the last date that work was submitted.

Late withdrawal appeals will be reviewed and a decision made by the Coordinator of Admissions and Records.

No-Show Policy

A student must either attend face-to-face courses or demonstrate participation in online courses by the last date to drop for a refund. A student who does not meet this deadline will be reported to the Admissions and Records Office and will be withdrawn as a no-show student. No refund will be applicable, and the student will not be allowed to attend/participate in the class or submit assignments. Failure to attend or participate in a course will adversely impact a student's financial aid award.

Instructor Initiated Withdrawal

A student who adds a class or registers after the first day of class is counted absent from

all class meetings missed. Each instructor is responsible for keeping a record of student attendance (face-to-face classes) or performance/participation (online classes) in each class throughout the semester.

When a student's absences equal twice the number of weekly meetings of a class (equivalent amount of time for summer session), the student may be dropped for unsatisfactory attendance in the class by the instructor.

Since attendance is not a valid measurement for online courses, a student may be withdrawn due to non-performance. A student should refer to his/her online course plan for the instructor's policy.

When an instructor withdraws a student for unsatisfactory attendance (face-to-face class) or non-performance (online class), the last date of attendance/participation will be documented. Withdrawal must be completed within five days of a student's meeting the withdrawal criteria. A grade of "W" will be recorded during the first sixty percent (60%) period of a course. A student withdrawn after the sixty percent (60%) period will receive a grade of "F" or "U" except under documented mitigating circumstances when a letter of appeal has been submitted by the student. A copy of this documentation must be placed in the student's academic file.

The student will be notified of the withdrawal by the Admissions and Records Office. An appeal of reinstatement into the class may be approved only by the instructor.

XII.   **Disability and Non-Discrimination Statements**

If you are a student with a documented disability who will require accommodation in this course, please register with the Disability Services Office located in the Advising Center for assistance in developing a plan to address your academic needs.

This College promotes and maintains educational opportunities without regard to race, color, national origin, religion, disability, sex, sexual orientation, gender identity, ethnicity, marital status, pregnancy, childbirth or related medical conditions including lactation, age (except when age is a bona fide occupational qualification), veteran status, or other non-merit factors.

Evacuation Procedure: Please note the evacuation route posted at the classroom doorway. Two routes are marked in case one route might be blocked.