COURSE PLAN

Course Number and Title: MTH 155 Statistical Reasoning (3 cr.)

Prepared by: Math Faculty   Fall, 2021
                                                    (Date)

Approved by: *S. Tolbert-Hurysz*   Fall, 2021
                    (Dean)   (Date)

I.   Course Description

MTH 155 – Statistical Reasoning. Presents elementary statistical methods and concepts including visual data presentation, descriptive statistics, probability, estimation, hypothesis testing, correlation and linear regression. Emphasis is placed on the development of statistical thinking, simulation, and the use of statistical software.

Prerequisite: Competency in MTE 1-5 as demonstrated through placement or unit completion or equivalent or Co-requisite: MDE 55   Learning Support for Statistical Reasoning. (Credit will not be awarded for both MTH 155   Statistical Reasoning and MTH 245: Statistics I. or equivalent)   Lecture: 3 hours per week.

II.   Introduction

This course is designed to introduce students to statistical ideas and concepts that apply to a variety of fields and every-day life. It satisfies the general education mathematics requirement for many degree programs.

III.   Student Learning Outcomes

Upon successful completion of this course, the student will be able to:

Technology
1.   Use appropriate technology in a given context.
2.   Use some form of spreadsheet application to organize information and make repeated calculations using simple formulas and statistical functions.
3.   Use technology to calculate descriptive statistics and test hypotheses.

Graphical and Numerical Data Analysis
4.   Identify the difference between quantitative and qualitative data
5.   Identify the difference between discrete and continuous quantitative data
6.   Construct and interpret graphical displays of data, including (but not limited to) box plots, line charts, histograms, and bar charts
7.   Construct and interpret frequency tables
8.   Compute measures of center (mean, median, mode), measures of variation, (range, interquartile range, standard deviation), and measures of position (percentiles, quartiles, standard scores)

Sampling and Experimental Design

9. Recognize a representative sample and describe its importance
10. Identify methods of sampling
11. Explain the differences between observational studies and experiments
12. Recognize and explain the key concepts in experiments, including the selection of treatment and control groups, the placebo effect, and blinding

Probability Concepts

13. Describe the difference between relative frequency and theoretical probabilities and use each method to calculate probabilities of events
14. Calculate probabilities of composite events using the complement rule, the addition rule, and the multiplication rule.
15. Use the normal distribution to calculate probabilities
16. Identify when the use of the normal distribution is appropriate.
17. Recognize or restate the Central Limit Theorem and use it as appropriate.

Statistical Inference

18. Explain the difference between point and interval estimates.
19. Construct and interpret confidence intervals for population means and proportions.
20. Interpret the confidence level associated with an interval estimate.
21. Conduct hypothesis tests for population means and proportions.
22. Interpret the meaning of both rejecting and failing to reject the null hypothesis.
23. Use a p-value to reach a conclusion in a hypothesis test.
24. Identify the difference between practical significance and statistical significance.

Correlation and Regression

25. Analyze scatterplots for patterns, linearity, and influential points
26. Determine the equation of a least-squares regression line and interpret its slope and intercept.
27. Calculate and interpret the correlation coefficient and the coefficient of determination.

Categorical Data Analysis

28. Conduct a chi-squared test for independence between rows and columns of a two-way contingency table.

IV. 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 problem or issue.
- Seek and evaluate the information needed to fully understand the problem or complex issue.
- Identify complexities of an issue, relevant perspective 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-reason 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 clarify 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

- **Textbook:** Introductory Statistics, openstax College, ISBN: 978-1-938168-20-8

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

- **Calculator:** TI-36X Pro, TI-83, or TI-84. There are variations of the TI-83 and TI-84; however, all of them will work for this course.

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

VII.   Course Content

- Graphical and Numerical Data Analysis
- Sampling and Experimental Design
- Probability
- Statistical Inference
- Correlation and Regression
- Categorical Data Analysis

VIII.   Evaluation

The grade for the course will be calculated from Tests, Quizzes, 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 Diversity 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.

The NRCC community values the pluralistic nature of our society. We recognize diversity including, but not limited to, race ethnicity, religion, culture, social class, age, gender, sexual orientation and physical or mental capability. We respect the variety of ideas, experiences and practices that such diversity entails. It is our commitment to ensure equal opportunity and to sustain a climate of civility for all who work or study at NRCC or who otherwise participate in the life of the college.