WINONA STATE UNIVERSITY

COLLEGE OF SCIENCE AND ENGINEERING

DEPARTMENT OF MATHEMATICS AND STATISTICS

**Course Outline – STAT 100**

**Title:** Numbers and Data in Society

**Number of Credits:** 3

**Catalog Description:** Promotion of statistical literacy for a better understanding of numbers and data in today’s society. Quantitative and statistical reasoning skills will be developed through a variety of topics presented in various contexts for which numbers, data, or information are commonly encountered, e.g. media, government, public health, sports, polls, elections, etc. Conceptual understanding of topics will be emphasized. Meets: GOAL 4.

**Possible Textbooks:**

* *Statistics: Concepts and Controversies by David S. Moore and William I. Notz. W.H. Freeman & Company, 2013.*
* *ISBN 10: 1-4641-2566-X; ISBN-13: 978-1-4641-2566-9*
* *Statistical Reasoning for Everyday Life by Jeff Bennett, William L. Briggs, and Mario F. Triola. Pearson, 2012.*
* *ISBN-10: 0321890132; ISBN-13: 9780321890139*
* *Resources from the NSF-funded CATALST project (http://www.tc.umn.edu/~catalst/about)*
* *Timely articles from various news sources involving numbers and data*

**Topics Covered:**

1. Historical Appreciation of Numbers and Data in Society
   1. Historical Purpose of collecting Numbers and Data (e.g. history of U.S. Census Bureau, Centers for Disease Control, World Health Organization, World Bank, etc.)
   2. Visual Depictions of Numbers and Data of Historical Importance (e.g. John Snow’s visual depiction of contaminated well, Florence Nightingale’s rose diagrams, Napoleon’s march to Moscow, Challenger explosion, etc.)
2. Numbers and Data in Government
   1. Why Governments Collect Data
      1. Understanding Large Numbers
      2. Visual Representations for Large Numbers
   2. The Use of Percentages and Rates for Large Numbers
   3. Concept of percent change, e.g. percent change in debt
   4. Concept of rates, e.g. debt / citizen, murders / 10,000 people, etc.
   5. The Use of Estimates in Government, e.g. poverty line, population growth, etc.
   6. (Optional) Additional topics related to statistical issues commonly found in government data
   7. Case study dealing with government data
3. Numbers and Data in Media
4. Why Journalists Use Numbers and Data
5. Rights and Responsibilities of Public Data
6. Numbers and Data in Opinion Polls and Elections
   1. Concept of Scope of Inference
   2. Concepts of bias, confounding, etc. in studies and surveys
   3. Concept of variation over repeated samples
   4. Concept of margin-of-error
7. Telling a Complete and Fair Story with your Numbers and Data
8. (Optional) Additional topics related to statistical issues commonly found in the media
9. Case Study: Prepare a newsworthy story for general consumption using numbers, data, and visualization.
10. Numbers and Data in Sports
    1. The Use of Numbers and Data to Evaluate Performance
       1. Summaries of Numerical Data, e.g. mean, median, standard deviation
       2. Numerical and Graphical Summaries for Comparisons
    2. Methods and Issues of Rankings
    3. Evaluation of Streaks
    4. (Optional) Additional topics related to statistical issues commonly found in sports data
    5. Case study dealing with sports data
11. Numbers and Data in Public Health
    1. Understanding Risk
       1. Concept of Conditioning in a 2x2 table
       2. Purpose of Row/Column Percentages
       3. Methods to Compare Row/Column Percentages (e.g. Absolute Difference, Relative Risk Ratio, Percentage Difference)
    2. Tests for Identifying Diseases
       1. Concerns and Issues with Testing for Disease Conditions
       2. Measuring the Accuracy of Tests (e.g. Sensitivity, Specificity, Predictive Value Positive / Negative)
    3. (Optional) Additional topics related to statistical issues commonly found in public health data
    4. Case study dealing with public health data
12. (Optional) Additional topics at discretion of instructor
    1. Topics must promote quantitative and statistical reasoning skills
    2. Topics must be of general interest to all students

**Listing of Sections to be Covered:** Not applicable to this course, since there is no standard textbook. Chosen sections of any text should correspond to the topics outlined above.

**Remarks:** None.

**Approximate Pace of Coverage:** Not Applicable.

**Method of Instruction:** Lecture-presentation, discussion, question-answer sessions,

use of calculators/computers, group work.

**Evaluation Procedure:** Homework assignments, case studies, exams.

**Minnesota Transfer Curriculum:** Goal 4 – Mathematical/Logical Reasoning

* Illustrate historical and contemporary applications of mathematical/logical systems.
* Clearly express mathematical/logical ideas in writing.
* Explain what constitutes a valid mathematical/logical argument (proof).
* Apply higher-order problem-solving and/or modeling strategies.

**MnSCU Learning Outcomes:**

* This course will promote a student’s ability to discuss and apply basic concepts which are essential for statistical literacy, including percentages and rates, basic graphical representations of data, basic data summaries, sampling variation, probability, and risk.
* This course will promote a student’s ability to understand how data are produced and what makes data trustworthy and reliable.
* This course will promote a student’s ability to appreciate how data can be used to enhance our understanding of our world and in decision making.
* This course will promote a student’s ability to critically evaluate the presentation and use of data by others.
* This course will promote a student’s ability to interpret numbers and data and communicate the information contained therein effectively themselves.

**Last Revised:** Spring 2014 by the Statistics Subgroup