WINONA STATE UNIVERSITY

COLLEGE OF SCIENCE AND ENGINEERING

DEPARTMENT OF MATHEMATICS AND STATISTICS

**Course Outline-MATH 100**

**Course Title:** Survey of Mathematics

**Catalog Description:** Study of networking, probability, statistical inference, and logic designed to illustrate the connection between contemporary mathematics and modern society.  Meets GOAL 4. Prerequisite: Qualifying score on the mathematics placement exam or MATH 050 - Intermediate Algebra. Grade only. Offered every semester.

**Number of Credits**: 3

**Text:** To be chosen from the following list.

* *The Heart of Mathematics,* by Burger and Starbird, Wiley, *most recent edition*
* *For All Practical Purposes – Mathematical Literacy in Today’s World*, published by W.H. Freeman and Company, *most recent WSU custom edition*

**Topics Covered**

## 1. Data Distributions

## Organize and display data

## Describe data displays in terms of shape, spread, and skewness/symmetry

## Calculate mean, median, quartiles, and standard deviations

## Create a descriptive data summary

## 2. Data Relationships

## Create a scatterplot to display the relationships between two numeric variables

## Discuss the effects of sample size, units, spread, and outliers on correlation

## Explain how regression equations can be used to make predictions

## 3. Probability

## Determine the probability of events in simple sample spaces

## Distinguish between discrete and continuous probability models

## 4. Data-based Decision-Making

## Distinguish simple random sampling from other sampling methods

## Discuss the appropriateness of a randomized comparative research design to a given research problem

## Discuss the relationship between a population and a sample and between parameters and statistics

## Justify the use of data from a sample to make inferences about a population

1. Describe when it is justified to draw conclusions about causation

## Distinguish between confidence interval and margin of error

## Create a plan for conducting an observational study

## Create a plan for conducting an experimental study

## 5. Circuits

## Describe Euler Circuits

## Determine if a path is an Euler Circuit

## Describe a unique authentic problem that could be solved using an Euler circuit

## Distinguish between an Euler Circuit and a Hamiltonian Circuit

## Create a Hamiltonian Circuit for an authentic problem that minimizes cost, time, or distance

## 6. Logic

## Translate verbal statements into symbolic statements in propositional logic

## Determine if statements are logically equivalent in propositional logic

## Differentiate between types of arguments

## Recognize invalid arguments

**Listing of Sections in Departmental Text to be Covered (For All Practical**

**Purposes – Mathematical Literacy in Today’s World, published by W.H. Freeman**

**and Company – WSU custom edition (2nd Ed.):**

Chapter 1 – Urban Services (all)

Chapter 2 – Business Efficiency (all)

Chapter 5 – Exploring Data: Distributions (all)

Chapter 6 – Exploring Data: Relationships (all)

Chapter 7 – Data for Decisions (all)

Chapter 8 – Probability: The Mathematics of Chance (all)

Chapter L – Logic (all + possible supplement)\

**Remarks:**

In Chapter 6, using Excel for larger computations of standard deviation, correlation, and/or least-squares regression is highly encouraged in order to remove trepidation on the students’ part.

The Logic section of the text may not be suitable and supplemental materials may be used to sufficiently meet needs as deemed necessary.

**Approximate pace of coverage:**

Chapter 1 and 2: approximately 9 course periods

Chapters 5, 6, and 7: approximately 16 course periods

Chapter 8 and Logic: approximately 17 course periods

**Method of Instruction:** Lecture/presentation, discussion, question and answer sessions, use of calculators and/or computers, extended and in-class group work.

**Evaluation Procedure:** Homework, quizzes, projects, midterm exams, and a final exam.

**Minnesota Transfer Curriculum:** *The following language should appear on each**instructor’s syllabus for the course:*

**Goal 4 under GEP:** ***Mathematics/Logical Reasoning*** – This is a General Education Program course that satisfies the Mathematics/Logical Reasoning requirement of the Minnesota Transfer Curriculum. The goal of this requirement is to increase students' knowledge about mathematical and logical modes of thinking. This will enable students to appreciate the breadth of applications of mathematics, evaluate arguments, and detect fallacious reasoning. Students will learn to apply mathematics, logic, and/or statistics to help them make decisions in their lives and careers. Minnesota's public higher education systems have agreed that developmental mathematics includes the first three years of a high school mathematics sequence through intermediate algebra.

Students will be able to:

1. Illustrate historical and contemporary applications of mathematics/logical systems.

Section 4, on data analysis, will teach students to analysis certain types of data to reason about, and solve, certain important types of real-world problems. Sections 1-3 provide necessary preparation for Section 4. Also, Section 5, on circuits, is designed to emphasize real-world applications.

2. Clearly express mathematical/logical ideas in writing.

To demonstrate the skills listed under 3A to 3H in the outline, a student must express certain basic mathematical and statistical ideas correctly in writing.

3. Explain what constitutes a valid mathematical/logical argument (proof).

All areas of the course give students practice in applying logical reasoning correctly. The section on logic (Section 6) provides a brief introduction to formal validity.

4. Apply higher-order problem-solving and/or modeling strategies.

The master the skills detailed in Section 4, students must learn important higher-order problem-solving skills, with Section 1-3 serving as necessary preparation. The emphasis in Section 5 and 6 is more on modeling than on problem-solving.

**MnSCU Learning Outcomes:**

**Last Revised:** Spring 2013 by the Mathematics Subgroup