Department: Mathematics

Course Title: Mathematical Decision Making

Level and/or Grade: Honors/ Grade 11/12

Prerequisite: B+ or better in Standard Algebra 2, B- or better in Honors Algebra 2

Course Description:

This course provides students the opportunity to apply mathematics as they model a range of situations to solve problems involving the use of algebra, geometry and trigonometry in diverse areas such as statistics and financial mathematics. Units include: Analyzing Numerical Data, Probability, Statistical Studies, Using Recursion in Models and Decision Making, Using Functions in Models and Decision Making, Decision Making in Finance, and Networks and Graphs. The course is highly participatory in nature as students learn in a cooperative environment where they engage in discussion and make presentations. Students will extend and learn new content as they attain independent learning and research skills needed post high school.

Learning Standards*: Through communication, representation, reasoning, making connections, and problem solving, students will be able to...

Standards for Mathematical Practice:
- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Number and Quantity:
- Represent and model with vector quantities.
- Perform operations on matrices and use matrices in applications.

Algebra:
- Use polynomial identities to solve problems.
- Solve systems of equations.

Functions:
- Understand the concept of a function and use function notation.
- Interpret functions that arise in applications in terms of the context.
- Analyze functions using different representations.
- Construct and compare linear, quadratic, and exponential models and solve problems.
- Model with trigonometric functions to solve problems.
- Interpret expressions for functions in terms of the situation they model.
**Geometry:**
- Experiment with transformations in the plane.
- Understand congruence in terms of rigid motions.
- Apply trigonometry to general triangles to find unknown measurements.
- Visualize relationships between two-dimensional and three-dimensional objects.
- Apply geometric concepts in modeling situations to solve design problems.

**Statistics and Probability:**
- Make inferences and justify conclusions from sample surveys, experiments and observational studies.
- Use the rules of probability and conditional probability of compound events in a uniform probability model.
- Calculate expected values and use them to solve problems.
- Use probability to evaluate outcomes of decisions.

*from the 2011 Massachusetts Curriculum Framework for Mathematics*

**Course Alignment with 21st Century Learning Expectations:**

Students will…

1. Become self-directed learners as they
   - Set goals and responsibility for learning.
   - Select strategies for problem solving.
   - Monitor one’s own learning through reflection.

2. Communicate effectively as they
   - Express ideas precisely and with coherence.
   - Use a variety of representations to express mathematics to multiple audiences.
   - Use appropriate vocabulary and symbolic notation effectively.

3. Apply problem-solving skills and critical and creative thinking as they
   - Apply mathematical knowledge to new, non-routine situations.
   - Evaluate and test different routes to solving a problem.
   - Demonstrate persistence.

4. Use technology appropriately as a tool for learning, collaboration, presentation, research, and design as they
   - Demonstrate proficiency with the graphing calculator as a tool for learning.
   - Communicate and collaborate with educators and peers using online systems.
   - Use technology strategically for independent learning, calculation and representation.

5. Act with integrity, respect and responsibility toward themselves, others, and the environment as they
   - Actively participate in class and demonstrates respectful behavior.
   - Respond to new and diverse perspectives.
   - Critique the work of others and accept the critique of others.

6. Exhibit flexibility and adaptability as they
   - Recognize mistakes as an essential part of learning.
   - Revise thinking to apply in context.
   - Approach new experiences with confidence.

7. Collaborate in diverse groups to share knowledge, build consensus, and achieve goals as they
   - Work in pairs and small groups to discuss and problem solve.
   - Construct team positive interactions.
   - Discuss a variety of viewpoints and demonstrate logical reasoning to make decisions.
8. Practice leadership in and service to their community as they
   - Support their peers in learning mathematics.
   - Participate in departmental activities that promote the understanding mathematics.
   - Use mathematical models to solve community problems.

9. Become contributing citizens in a global society as they
   - Understand the role of mathematics in shaping the world.
   - Exchange ideas and resources beyond the classroom.
   - Make career choices that positively impact future of the mathematical learning.

*Assessment:*

- See attached grading policy.