MEDFORD HIGH SCHOOL
COURSE SYLLABUS

Department: Mathematics
Course Title: Topics in Discrete Mathematics
Level and/or Grade: Standard; Grade 12
Prerequisite: Passing grade in Algebra 2

Course Description:

This course provides students the opportunity to study numerous disjoint topics in the field of Discrete Mathematics. Students will use discrete models to interpret data, make inferences, and solve problems that answer questions to real situations. They will determine “reasonableness” and evaluate mathematical representations of real-world situations. Modeling is embedded throughout the course linking mathematics and statistics to everyday life, work, and decision-making. Students will choose and apply appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Topics include graph theory, combinatorics, linear programming, arithmetic & geometric growth, statistical modeling, iteration and recursion, voting theory, fair division, symmetry & tessellations, finance, and more.

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 use structure.
- Look for and express regularity in repeated reasoning.

Number and Quantity:
- Reason quantitatively and use units to solve problems.
- Represent and model with vector quantities.
- Perform operations on matrices and use matrices in applications.

Algebra:
- Interpret the structure of expressions.
- Write expressions in equivalent forms to solve problems.
- Create equations that describe numbers or relationships.
- Understand solving equations as a process of reasoning and explain the reasoning.
- Solve equations and inequalities in one variable.
- Solve systems of equations.
- Represent and solve equations and inequalities graphically.
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.
- 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.
- Visualize relationships between two-dimensional and three-dimensional objects.
- Apply geometric concepts in modeling situations to solve design problems.

Statistics and Probability:
- Summarize, represent, and interpret data on a single count or measurement value.
- Interpret linear models to distinguish between causation and correlation.
- Understand independence and conditional probability and use them to interpret data.
- 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.