**MINUTEMAN MIDDLE SCHOOL TECHNICAL LITERACY GRADE 7**

**The Department’s Educational Philosophy**

Minuteman Regional High School’s Middle School Program for Technical Literacy (previously called “Outreach”) dedicates itself to exposing students to the many different forms of engineering through a variety of hands-on projects and lessons. All lessons are built around the [**Massachusetts Science and Technology/Engineering Framework**](https://www.doe.mass.edu/frameworks/scitech/2016-04.pdf)**.**

**Guiding Principles**

To help introduce students into the world of engineering. Students are taught safety and techniques that will be used to help build projects that will solve real world problems. The Engineering Design Process is introduced and utilized in students work to help find solutions to assigned design prompts. Minuteman Tech takes subjects taught in other classes and applies them to real world applications.

**Background to the Curriculum**

Students will use concepts taught in other classes and apply them to solutions to real world problems.

**Core Topics/Questions/Concepts/Skills**

* **Design and Build Bobsled**
* **Lunar Lander**
* **Load Bearing Towers**
* **Boats**
* **Rockets**
* **CO2 Cars**

**Course-End Learning Objectives**

***Students will:***

* Study space technology via the design, building, and testing of a high-pressure water rocket. Students will learn about Newton’s laws of motion, psi, drag, air density, rocket fuels, and the history of modern rocketry, all the while following the engineering design process as a guide.
* Design, build and test a model boat for speed, buoyancy, and displacement in a 16’ hydro-test tank. All boats will be built using tools such as the band saw, belt sander, drill press, Dremel, and hot glue gun. Students must show proficient use of all of these tools.
* Build a CO2 racecar that will be tested on a 40’ CO2 track. They will study the effects of aerodynamics, friction, and mass as factors in building a fast car. Students will learn the importance of “modify and improve” design based on multiple tests of their cars.
* Take on the Olympic sport of Bobsledding. This Olympic sport has multiple physics applications, engaging topics surrounding inertia, kinetic energy, thermal dynamics, slope friction, and G-force. After the students build their bobsled, it will be tested on a 32’ bobsled track. All the sleds will be timed to the .001 of a second with our Kelvin Timing system.

**Note**: We will use our three “MSET” testing machines, which will give real-time feedback on many of the above “physics” topics; i.e., tension, compression, friction, buoyancy, and impact.

**Grade 7 Standards Addressed**

***Technology/Engineering***

* Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem. Use a model of each solution to evaluate how variations in one or more design features, including size, shape, weight, or cost, may affect the function or effectiveness of the solution.
* Generate and analyze data from iterative testing and modification of a proposed object, tool, or process to optimize the object, tool, or process for its intended purpose.
* Construct a prototype of a solution to a given design problem. \*
* Explain the function of a communication system and the role of its components, including a source, encoder, transmitter, receiver, decoder, and storage.
* Compare the benefits and drawbacks of different communication systems.
* Research and communicate information about how transportation systems are designed to move people and goods using a variety of vehicles and devices.
* Identify and describe subsystems of a transportation vehicle, including structural, propulsion, guidance, suspension, and control subsystems.
* Show how the components of a structural system work together to serve a structural function. Provide examples of physical structures and relate their design to their intended use.
* Use the concept of systems engineering to model inputs, processes, outputs, and feedback among components of a transportation, structural, or communication system.

***Physical Science***

* Analyze data to describe the effect of distance and magnitude of electric charge on the strength of electric forces.
* Use scientific evidence to argue that fields exist between objects with mass, between magnetic objects, and between electrically charged objects that exert force on each other even though the objects are not in contact.

**Assessment**

As this is an ungraded class, students will be expected to participate and follow all safety rules and classroom guidelines. Project completion will dictate any and all grading or participation measurements.