

Pequannock Township School District

Curriculum Syllabus

Robotics and Alternative Energy / Grade 7

Course Description:

The Industrial Revolution began the expansion of the national world economies. This technological revolution is what fuels and sustains the continuation of those initial developments. In this course, we will study the development and the explosion of technology as well as how technology affects our lives every day. Alternative forms of energy and robotics will be the emphasis of the curriculum. Technological Literacy Technology, any modification of the natural world designed by human beings to solve human problems, enhanced human life, or extended human capability, was identified by the United States Department of Labor as an essential workplace competency in a 1992 report called the Secretary's Commission on Achieving Necessary Skills (SCANS). SCANS states that students should be able to select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot equipment. The Department of Education recognize its importance by including technology in the original cross-content workplace readiness standards. In keeping with today's technological society, technological literacy has been further emphasized by its inclusion as a separate standards area that focuses on both computer and information literacy and technology education.

Course Proficiencies:

The following is a list of proficiencies that describe what students are expected to know and be able to do as a result of successfully completing this course. The following proficiencies are the basis of the assessment of student achievement. The learner will demonstrate mastery of:

1. Each student will design and create a product that addresses a real-world problem using the design process and working with specific criteria and constraints.
8.2.8.B.1
2. Each student will create a prototype for solving a global problem, documenting how the proposed design features affect and feasibility of the prototype through the use of engineering, drawing, and other technical methods of illustration.
8.2.12.B.2
3. Students will solve a science-based design challenge and build a prototype using science and math principles throughout the design process.
8.2.8.B.3
4. Each student will analyze the interactions among various technologies and collaborate to create a product or system demonstrating their interactivity.
8.2.12.G.1

5. Students will develop strategies to reinforce positive attitudes and productive behaviors that impact critical thinking and problem solving skills. 9.1.8.A.1
6. Each student will implement problem-solving strategies to solve a problem in school or the community. 9.1.8.A.2
7. Students will demonstrate the use of compromise, consensus, and community building strategies for carrying out different tasks, assignments, and projects. 9.1.8.C.2
8. Each student will compute unit rates associated with ratios of fractions, including ratios of lengths, areas, and other quantities measured in like or different units. 7.RP.A.1
9. Students will be able to support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. WHST.6-8.1B
10. Students will communicate clearly and effectively and with reason. CRP4.
11. Each student will utilize critical thinking to make sense of problems and persevere in solving them. CRP8.
12. Each student will work productively in teams while using cultural global competence. CRP12.

Scope and Sequence - Trimester Course

Unit 1 - Review of Engineering and Design

As students begin the trimester in this class, there are essentials that need to be understood and mastered. The most important essential in any class, classroom or laboratory is safety. Following and understanding safety rules and why these rules are important, will help keep students from being injured. Additionally and obviously, the proper handling of equipment and supplies by the student and influencing peers to follow those same rules, he/she will control his/her own safety.

Outstanding presentations of completed work can sometimes be more important than the content of that presentation. Proper and neat lettering, neat line work, correct measurements, simplification of fractions, and presenting information verbally and written are lifelong necessary skills. All will be addressed at the beginning of every STEM subject area course at PV Middle School.

Unit 2 - Alternative Energy Sources and Uses

The future of our society depends on the development of clean, efficient, alternative (other than fossil fuels) energy for both industrial and personal use. Students will be developing an

understanding of various forms of energy production and use. Alternative energy sources, such as nuclear, wind, ocean tidal and wave power, hydroelectric power, geothermal power, light power (solar), will be introduced to students. Students will also gain a solid understanding of renewable energy sources, such as biofuel from crops and biomass from trash. Furthermore, fossil fuels, including natural gas, coal, and petroleum will be studied.

Unit 3 - Robotics

Students will learn how to “Speak the Lego Mindstorms Language” by programming directions on a PC and then download those directions to a mobile computer powered machine that they will be responsible for building. Their mobile computer will then run a predetermined, multi-directional course with multiple turns on the floor of the lab. Students will be able to adjust their programming to compensate for their constructed models’ weight distribution, wheel size, floor friction, length of vehicle, and time factors.

Assessments

Evaluation of student achievement in this course will be based on the following:

1. Verbal and written presentations of information, demonstration of appropriate lab conduct, explanation of the interdependence of parts to form a more complex system, accurate measuring.
2. Completion of renewable and nonrenewable energy lab station activity, written and verbal presentation of information, participation and success during renewable energy mini project (prototype).
3. Student collaboration, teacher generated rubrics for renewable energy design project and robot designs.

Curriculum Resources

Anchor Programs/Teacher Materials

- Lego Mindstorms construction set (and course),
- Investigative subsystem packet and research websites
- 16 scale ruler
- engineering drawings (aerial views and cross sections)
- model objects (to use to create drawings)

- Various tools including, crosscut saw, hammer, chisel, portable electric drill, coping saw, circle template, ruler, pencil, wood vise, and square.
- Chromebooks for report and presentation creation

Home and School Connection

The following are suggestions and/or resources that will help parents support their children:

- Have ongoing discussions on overall lab safety and the importance of following lab rules
- Explore resources such as <https://www.mindresearch.org/stem-resources> and <https://www.edutopia.org/article/STEM-resources-downloads>
- Visit places such as the Liberty Science Center to further promote student exploration of STEM topics
- [Lego Mindstorm](#)