Pequannock Township School District Curriculum Syllabus

Freshmen STEM

Course Description:

The goal of this course is to give students the skills they need to succeed in STEM fields. These skills include, but are not limited to: utilizing and applying the engineering problem solving model, developing an understanding of weights and measurements, acquire skills in orthographic and isometric drawing, developing an understanding of aerodynamics, electrical circuits, and structural engineering.

Class periods will be spent working in groups on projects, involving each step of the scientific and engineering method. This class will allow students to experience school and the classroom in ways, which promote growth in common elements found in science and engineering.

Course Standards:

Practice 2. Collaborating Around Computing

1. 2 1. Cultivate working relationships with individuals possessing diverse perspectives, skills, and personalities.
2. 2 2. Create team norms, expectations, and equitable workloads to increase efficiency and effectiveness.
3. 2 3. Solicit and incorporate feedback from, and provide constructive feedback to team members and other stakeholders.

Practice 6. Testing and Refining Computational Artifacts

4. 6 1. Systematically test computational artifacts by considering all scenarios and using test cases.
5. 6 2. Identify and fix errors using a systematic process.
6. 6 3. Evaluate and refine a computational artifact multiple times to enhance its performance, reliability, usability, and accessibility.

9.2 Career Awareness, Exploration, and Preparation

This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

Scope and Sequence

Unit 1 – Foundation of Engineering & Problem Solving Technology Learning Activities Students will examine the engineering design process. Students will review the standards weights and measurements we use in the STEM related field. The concept of both accuracy and precision will be introduced. Students will develop problem-solving skills used in the STEM related field. The application of a problem-solving model will be introduced.	9.3.ST.5 9.3.ST-ET.1 9.3.ST-ET.2 9.3.ST-ET.4 9.3.ST-SM.2 9.3.ST-SM.4 8.2.12.D.1 8.1.12.F.1
Unit 2 – Weights and Measurements & Drawing and Scale Students will review the standards weights and measurements we use in the STEM related field. The concept	9.3.ST.5 9.3.ST-ET.2

of both accuracy and precision will be introduced. Students will review the standards of drawing and the use of scales in the STEM related field. The proper use of drawing tools and appropriate scale will be introduced.	9.3.ST-SM.1 8.1.12.A.1 8.2.12.C.5 8.2.12.D.3
Unit 3 – Structural Engineering Students will review the structural engineering in forces and components commonly used in the STEM related field. The proficiency in theory and practical building skills will be emphasized.	9.3.ST-ET.1 9.3.ST-ET.2 9.3.ST-ET.4 9.3.ST-SM.2 8.1.12.A.1 8.2.12.B.1 8.2.12.C.7 CRP8

Unit 4 – Electrical Engineering Students will review the basic electrical circuits used in the STEM related field. The application of both theory and components will be introduced. **Unit Rationale:** The application of electrical engineering is widely practiced on a global scale. Understanding these concepts will allow our students to great proficiency improving their marketable skills and confidence.	9.3.ST-ET.1 9.3.ST-ET.2 9.3.ST-ET.4 9.3.ST-SM.2 9.3.ST-SM.4 8.1.12.A.1 8.2.12.D.1 8.2.12.E.3
Unit 5 – Aerospace Engineering Students will review the aerospace engineering in theory and components commonly used in the STEM related field. The proficiency in theory and practical building skills will be emphasized. **Unit Rationale:** The use of theoretical and practical knowledge in aerospace engineering is widely practiced on a global scale. Developing proficiency in these skills will allow our students to utilize critical resources further improving their marketable skills and confidence.	9.3.ST-ET.1 9.3.ST-ET.2 9.3.ST-ET.4 9.3.ST-SM.2 9.3.ST-SM.4 8.1.12.A.1 8.2.12.C.3 8.2.12.D.1 ETS1.B ETS1.C

Assessments

Essential Questions	**Enduring Understandings**
● How does the engineering design process differ from the scientific process? ● What are the steps in the engineering design process? ● What is iteration? ● What is a mind map, design brief, decision matrix? ● What are the steps of the problem-solving model? ● How do we choose a solution? ● What does manufacturing require to reproduce a prototype?	● Because engineers and scientists have different objectives, they follow different processes in their work. Scientists perform experiments using the scientific method; whereas, engineers follow the creativity-based engineering design process. ● The engineering design process is a series of steps that engineers follow to come up with a solution to a problem. ● The steps of the engineering design process are to: 1. Identify Problems and Opportunities 2. Clarifying and Framing the Problem 3. Investigating and Conducting Research 4. Brainstorm Alternative Solutions 5. Choose a Solution 6. Do Development Work 7. Modeling and Prototyping 8. Testing and Evaluating 9. Redesigning and Improving

	10. Presenting and Producing ● Identify each step of the problem-solving model. ● A design brief must be used to determine a solution. ● Develop and produce a prototype included manufacturing requirements.

Curriculum Resources

Various

Home and School Connection

VIII. Course Resource Materials:

Instructional Resources:

- **http://www.state.nj.us/education/cccs/standards/9/**
- **http://tryengineering.org/**

Technology Resources:

- **http://bridgestoprosperity.org/**