Course Title: **Senior STEM** **Board Approval Date: August 2016**
Credit (Secondary): 1
Grade Level / Course Summary with Big Ideas:

The Senior STEM course will provide a framework for authentic scientific research. Students will pursue authentic questions, some of which originate from them; make sense of their observations through scientific practices; and situate their understandings within the larger context of core ideas of science and engineering.

Apply the concept that many technological problems require a multi-disciplinary approach.

A major practice of scientists and engineers is planning and carrying out a systematic investigation, which requires the identification of what is to be recorded and, if applicable, what are to be treated as the dependent and independent variables (control of variables). Observations and data collected from such work are used to test existing theories and explanations or to revise and develop new ones.

The goal for students is to construct logically coherent explanations of phenomena that incorporate their current understanding of science, or a model that represents it, and are consistent with the available evidence.

Communicate their findings and analysis of their investigation.

Big Ideas:

1. Asking questions and defining problems.
2. Developing and using models.
3. Planning and carrying out investigations.
4. Analyzing and interpreting data.
5. Using mathematics and computational thinking.
6. Constructing explanations and designing solutions.
7. Engaging in argument from evidence.
8. Obtaining, evaluating, and communicating information.

Grade Level Modules (Units):	**Suggested Timeline # of Weeks or # of Class Periods/Lessons**
1. Practices in Science	3 Blocks
2. Planning and Carrying Out Investigations	16 blocks
3. Constructing Explanations and Designing Solutions, Engaging in Argument from Evidence	16 Blocks
4. Communicating the Results	5 Blocks
5. Practices in Engineering	3 Blocks
6. Planning and Carrying Out An Engineering Investigations	16 Blocks
7. Constructing Explanations and Designing Solutions, Engaging in Argument from Evidence for an Engineering Problem	16 Blocks
8. Communicating the Results for Engineering Design	5 Blocks

Learning Activities/Modes of Formative and Summative Assessment:

1. Science begins with a question about a phenomenon and seeks to develop theories that can provide explanatory answers to such questions.
2. Science involves the construction and use of a wide variety of models and simulations to help develop explanations about natural phenomena.
3. Scientific investigation will be conducted in the field or the laboratory.
4. Scientific investigations produce data that must be analyzed in order to derive meaning.
5. In science, mathematics and computation are fundamental tools for representing physical variables and their relationships.
6. The goal of science is the construction of theories that can provide explanatory accounts of features of the world.
7. In science, reasoning and argument are essential for identifying the strengths and weaknesses of a line of reasoning and for finding the best explanation for a natural phenomenon.
8. Science cannot advance if scientists are unable to communicate their findings clearly and persuasively or to learn about the findings of others.
9. Engineering begins with a problem, need, or desire that suggests an engineering problem that needs to be solved.
10. Engineering makes use of models and simulations to analyze existing systems so as to see where flaws might occur or to test possible solutions to a new problem.
11. Engineers use investigation both to gain data essential for specifying design criteria or parameters and to test their designs.
12. Engineers analyze data collected in the tests of their designs and investigations; this allows them to compare different solutions and determine how well each one meets specific design criteria—that is, which design best solves the problem within the given constraints.
13. In engineering, mathematical and computational representations of established relationships and principles are an integral part of design.
14. Engineering design, a systematic process for solving engineering problems, is based on scientific knowledge and models of the material world.
15. In engineering, reasoning and argument are essential for finding the best possible solution to a problem.
16. Engineers cannot produce new or improved technologies if the advantages of their designs are not communicated clearly and persuasively.

    Rubrics will be used for formative and summative assessments.

Primary Instructional Resources:

1. Science textbooks from all content areas and engineering textbooks from all engineering disciplines.
2. **How Things Work, the Physics of Everyday Life**
3. **A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012), http://www.nap.edu/read/13165/chapter/1**
4. Multiple sources for background research, including but not limited to the internet.