Grade level: 11th & 12th grade **Course Title: STEM Science** **Topic/Concept: The Design/Engineering Process**

Time Allotment: 15 days **Unit Sequence: 1**

Major Concepts to be learned:

- Engineering process

Expected Skills to be demonstrated:

- Knowledge and application of Engineering Process
- Comparison with the scientific method
- Compare and contrast science and engineering

PA Standards/Anchors:	Eligible Content:
S11.A.1 S11.A.2	S11.A.1.1.4 S11.A.2.1.1-5

Instructional Strategies:	Assessments:
• Article analysis: engineering vs science • Engineering tasks • Direct instruction • Whitebox Learning Program	• Engineering vs science presentations (flexible format) • Engineering tasks

Grade level: 11th & 12th grade **Course Title: STEM Science** **Topic/Concept: Building Structures with Purpose**

Time Allotment: 40 days **Unit Sequence: 2**

Major Concepts to be learned:

- Structural Design

Expected Skills to be demonstrated:

- Research Skills
- Conceptual Understanding Structural Principles
- Conceptual Understanding of Science Principles Associated with Building Purpose
- Blueprints
- Budgeting
- Constructing & Testing Structures

PA Standards/Anchors:	Eligible Content:
S11.A.1 S11.A.2 S11.A.3 S11.B-D	S11.A.1.1-5 S11.A.2.1-2 S11.A.3.1-4 B-D Variable depending on context of selected structural purpose

Instructional Strategies:	Assessments:
• Internet based research • Concept labs • Direct Instruction • Design Challenges	• Quizzes • Labs • Project Based Assessments (Design challenges) • Whitebox Learning Program assignments

Grade level: 11th & 12th grade | **Course Title: STEM Science** | **Topic/Concept: Flight**

Time Allotment: 25 days | **Unit Sequence: 3**

Major Concepts to be learned:

- Aerodymics
- Forces

Expected Skills to be demonstrated:

- Design flying vehicle (glider/drone/etc) to specific sets of specifications
- Test vehicle performance
- Optimize vehicle performance

PA Standards/Anchors:	Eligible Content:
S11.A.1 S11.A.2 S11.A.3 S11.C.3	S11.A.1.1-5 S11.A.2.1-2 S11.A.3.1-4 S11.C.3.1-3

Instructional Strategies:	Assessments:
• Internet based research • Concept labs • Direct Instruction • Virtual (internet based) and real-world Design Challenges	• Quizzes • Labs • Project Based Assessments (Design challenges) • Whitebox Learning Program Assignments

Grade level: 11th & 12th grade | **Course Title: STEM Science** | **Topic/Concept: Newton's Law**

Time Allotment: 30 days | **Unit Sequence: 4**

Major Concepts to be learned:

- Newton's Law

Expected Skills to be demonstrated:

- Learn and Apply Newton's Laws in Real World Scenarios
- Design vehicle (such as CO2 car) to specific sets of specifications
- Test and optimize car performance
- Build and test (CO2) car

PA Standards/Anchors:	Eligible Content:
S11.A.1 S11.A.2 S11.A.3 S11.C.3	S11.A.1.1-5 S11.A.2.1-2 S11.A.3.1-4 S11.C.3.1-3,5,6

Instructional Strategies:	Assessments:
• Internet based research • Concept labs • Direct Instruction • Virtual (internet based) and real-world Design Challenges	• Quizzes • Labs • Project Based Assessments (Design challenges) • Whitebox Learning Program Assignments

Grade level: 11th & 12th grade | **Course Title: STEM Science** | **Topic/Concept: Projectile Motion**

Time Allotment: 30 days | **Unit Sequence: 5**

Major Concepts to be learned:

- Projectile Motion

Expected Skills to be demonstrated:

- Learn and apply the principles of projectile motion in real world scenarios
- Design apparatus that will launch projectiles
- Test and optimize apparatus performance

PA Standards/Anchors:	Eligible Content:
S11.A.1 S11.A.2 S11.A.3 S11.C.2 S11.C.3	S11.A.1.1-5 S11.A.2.1-2 S11.A.3.1-4 S11.C.2.3 S11.C.3.1-3,5-6

Instructional Strategies:	Assessments:
• Internet based research • Concept labs • Direct Instruction • Virtual (internet based) and real-world Design Challenges	• Quizzes • Labs • Project Based Assessments (Design challenges) • Whitebox Learning Program Assignments

Grade level: 11th & 12th grade | **Course Title: STEM Science** | **Topic/Concept: Forms of Energy**

Time Allotment: 30 days | **Unit Sequence: 6**

Major Concepts to be learned:

- Forms of energy
- Energy Transfers
- Mechanical Advantage
- Work and Power

Expected Skills to be demonstrated:

- Learn and apply the principles of potential and kinetic energy as well as work and power in real world scenarios
- Design apparatus (utilizing simple machines) that will launch projectiles
- Test and optimize apparatus performance

PA Standards/Anchors:	Eligible Content:
S11.A.1 S11.A.2 S11.A.3 S11.C.2 S11.C.3	S11.A.1.1-5 S11.A.2.1-2 S11.A.3.1-4 S11.C.2.1-4 S11.C.3.1-6

Instructional Strategies:	Assessments:
• Internet based research • Concept labs • Direct Instruction • Virtual (internet based) and real-world Design Challenges	• Quizzes • Labs • Project Based Assessments (Design challenges) • Whitebox Learning Program Assignments

Grade level: 11th & 12th grade | **Course Title: STEM Science** | **Topic/Concept: Final Project**

Time Allotment: 20 days | **Unit Sequence: 7**

Major Concepts to be learned:

- Application of multiple concepts from previous units

Expected Skills to be demonstrated:

- Design an apparatus that will perform a specific task that incorporates multiple principles covered thoughout the course
- Demonstrate and explain what principles are utilized in the apparatus
- Test, evaluate and optimize apparatus performance

PA Standards/Anchors:	Eligible Content:
S11.A.1 S11.A.2 S11.A.3 S11.B-D	S11.A.1.1-5 S11.A.2.1-2 S11.A.3.1-4 B-D Variable depending on selected task

Instructional Strategies:	Assessments:
• Internet based research • Concept labs • Direct Instruction • Virtual (internet based) and real-world Design Challenges	• Quizzes • Labs • Project Based Assessments (Design challenges)