CREATING TECHNOLOGY

LENGTH OF TIME: One quarter, every other day, for 90 minutes

GRADE LEVEL: 8

COURSE STANDARDS:
Students will:
1. Investigate various careers involved in the design-engineering field.
2. Communicate information using a variety of graphic and electronic communication processes.
3. Analyze the steps involved in the manufacturing process e.g., design, development, production, marketing and servicing of products and systems (PA Standard 3.4.8.E6)
4. Examine power systems are used to drive and provide propulsion to other technological products or systems. (PA Standard 3.4.8.E3)
5. Test and evaluate the solutions for a design problem. (PA Standard 3.4.8.D1)
6. Operate and maintain systems in order to achieve a given purpose (PA Standard 3.4.8.D2)
7. Evaluate the criteria and constraints of a design (PA Standard 3.4.8.C1)
8. Explore the design process as a collaborative endeavor in which each person in the group presents his or her ideas in an open forum (PA Standard 3.4.8.C2)
9. Assess the impact of computers and computer-controlled devices in solving problems.
10. Explain how controls are steps that people perform using information about the system that causes systems to change (PA Standard 3.4.8.A2)

COURSE STANDARD COMPUTER SCIENCE:
1. Systematically identify and fix problems with computing devices and their components (PA Standard 2.CS.03)
2. Collect data using computational tools and transform the data to make it more useful and reliable (PA Standard - 2.DA.08)
3. Systematically test and refine programs using a range of test cases (PA Standard 2.AP.17)
4. Systematically identify and fix problems with computing devices and their components(Standard - 2.CS.0)

INTERNATIONAL TECHNOLOGY STANDARDS (ITEA)
The Nature of Technology
Std 1 – Students will develop an understanding of the characteristics and scope of technology.
Std 2 – Students will develop an understanding of the core concepts of technology.
Std 3 – Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
Technology and Society

Std 4 – Students will develop an understanding of the cultural, social, economic, and political effects of technology.
Std 5 – Students will develop an understanding of the effects of technology on the environment.
Std 6 – Students will develop an understanding of the role of society in the development and use of technology.
Std 7 – Students will develop an understanding of the influence of technology on history.

Design

Std 8 – Students will develop an understanding of the attributes of design.
Std 9 – Students will develop an understanding of engineering design.
Std 10 – Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Abilities for a Technological World

Std 11 – Students will develop abilities to apply the design process.
Std 12 – Students will develop abilities to use and maintain technological products and systems.
Std 13 – Students will develop abilities to assess the impact of products and systems.

The Designed World

Std 14 – Students will develop an understanding of and be able to select and use medical technologies.
Std 15 – Students will develop an understanding of and be able to select and use agricultural and related biotechnologies.
Std 16 - Students will develop an understanding of and be able to select and use energy and power technologies.
Std 17 - Students will develop an understanding of and be able to select and use information and communication technologies.
Std 18 - Students will develop an understanding of and be able to select and use transportation technologies.
Std 19 - Students will develop an understanding of and be able to select and use manufacturing technologies.
Std 20 - Students will develop an understanding of and be able to select and use construction technologies.

RELATED PA ACADEMIC STANDARDS FOR SCIENCE AND TECHNOLOGY

3.1 Unifying Themes
- A. Systems
- B. Models
- C. Patterns
- D. Scale
- E. Change

3.2 Inquiry and Design
- B. Process Knowledge
- D. Problem Solving in Technology

3.4 Physical Science, Chemistry and Physics
- A. Matter

B. Energy
C. Forces and Motion

3.5 Earth Sciences
B. Resources

3.6 Technology Education
A. Biotechnology
B. Information Technology

3.7 Technological Devices
A. Tools
B. Instruments
C. Computer Operations
D. Computer Software
E. Computer Communication Systems

3.8 Science, Technology and Human Endeavors
A. Constraints
B. Meeting Human Needs
C. Consequences and Impacts

PERFORMANCE ASSESSMENTS:
Students will demonstrate achievement of the standards by:

1. Creating a remote controlled machine using a variety tools and equipment safely.
2. Documenting and presenting mathematical and scientific principles to the solution of a transportation problem.
3. Developing technical drawings using computer assisted software.
4. Designing a computer program to complete a task.
5. Using a variety of mediums, design and develop a presentation that documents the steps of the engineering design process/design thinking process
6. Applying the concepts of the four power systems by manufacturing a remote controlled machine.
7. Becoming a member of an engineering team that will solve a technical problem

DESCRIPTION OF COURSE:
In Engineering Design students develop critical thinking and problem-solving skills. Engineering Design integrates the technological problem solving method with knowledge of science, mathematics, communications and other disciplines. It provides students with opportunities to research, design, develop, build, test and evaluate solutions to real lift problems related to meeting human needs and wants. Content is drawn from Biotechnological, Informational, Computer, and Physicals systems

TITLES OF UNITS:

A. Introduction to Design Thinking	week 1
B. Graphic Design	week 1
C. Robotic Systems	week 2

D. Mechanical Systems	week 2,3
E. Electrical & electronic systems	week 3,4
F. Fluid systems	week 4,5
H. Design	week 5,6
I. Computer Aided Drafting	weeks 6,7
J. Manufacturing Techniques	weeks 7, 8, 9

SAMPLE INSTRUCTIONAL STRATEGIES:
1. Cooperative Learning
2. Group Activities
3. Individual Activities
4. Self-directed learning
5. Demonstrations
6. Labs/Exploration
7. Research
8. Writing
9. Projects

MATERIALS:
1. Teacher made resources
2. Student made resources
3. Vex Robotics Kit
4. Computer Aided Drafting Programs and 3-D Printer
5. Safe Accessible Lab and necessary equipment
6. Applicable computers that will support software and student work.
7. Various graphic design materials.

METHODS OF ASSISTANCE AND ENRICHMENT:
1. Guest speakers
2. Advanced Computer Programs and Tasks
3. Teachers from other disciplines

PORTFOLIO DEVELOPMENT:
1.

METHODS OF EVALUATION:
1. Summative
    - Unit/Lab Activities including Rubric
    - Individual projects
    - Competency – Do they have the basic knowledge for success.

- Performance – Application of knowledge to create design success

2. Formative
    - Teacher assessment
    - Worksheets
    - Group Participation and Group projects
    - Competency – Do they have the basic knowledge for success.
    - Productivity – Are they productive workers that can responsibly, produce quality work with little supervision.

INTEGRATED ACTIVITIES:

1. Writing - Students create a work journal-
2. Math concepts –Students will use math formulas and math concepts when solving problems.
3. Science – Students will use scientific formulas and scientific concepts when solving problems