COURSE DESCRIPTION

8th Grade Technology Education

This is an elective course for students who are entering 8th grade and are interested in how technologies impact their lives. During this course, students will look at different technological systems including material handling, building systems, hydraulics and the impacts of technology in today's world. Laboratory experiences may include, using plastic fabrication techniques to create clocks. You can design and build your own CO2 car, learn how with proper design, towers and bridges hold all that weight. Discover the basics of welding and decide what you want to create through casting metal. You can also design and build a structure.

Prerequisite NONE

Credit .5

GOAL STATEMENTS: Referenced To State Standards

Upon completion of the 8th Grade Technology Education this course, students will be able to:

- Think about new technologies and discuss the positive and negative impacts to individuals, society and the ecosystem.
  Unit – Controlling Technology **Standard: A.4.9, A.8.1, A.8.2, A.8.3, A.8.5, C.4.2, C.8.4, D.4.1, D.4.5, D.8.1, D.8.3, D.8.4**

- Discuss how technologies have changed over the years and forecast where they may be in the future.
  Unit – Impacts of technology **Standard: A.4.1, A.4.4, A.8.1, A.8.2, A.8.5 A.8.7, B.8.1, B.8.4, C.8.2, C.8.5, D.8.4, D.8.5**

- Explain how there may be several solutions to a problem by using technological design, construction and testing techniques.
  Unit – Engineering **Standard: A.8.2, A.8.3, B.8.4, B.8.6, C.8.2, C.8.4, C.8.6.**

- Understand the basics of CAD/CAM programs and how robots are used in the manufacturing process.
  Unit – Robotics **Standard: A.8.2, A.8.3, B.8.3, B.8.7, C.8.5, C.8.6**

- Compare, contrast and analyze various energy transfer systems using inputs, processes and outputs.
  Unit – Hydraulics **Standard: A.8.2, A.8.3, B.8.1, B.8.2, B.8.3, B.8.4, D.8.2**

- Discuss and analyze various systems within a given area and explain how those systems are effected by: cost considerations, the environment, and human needs and wants.
  Unit – Building systems, Construction **Standard: A.4.8, A.8.2, A.8.3, B.8.5, B.8.6, C.8.2, C.8.5, C.8.6**

- Recognize the connections between technology and other disciplines and apply those relationships through technological process of design, processing and testing.
  Unit – Manufacturing **Standard: A.8.2, A.8.3, B.8.1, B.8.3, B.8.7, C.8.2**

- Use common tools to change the physical appearance of materials using different technologies to increase their value and usefulness.
  Unit – Material processing **Standard: A.4.2, A.4.4, A.8.1, A.8.2, A.8.3, A.8.7, B.4,6, B.4.7, B.8.1, B.8.4, B.8.6, B.8.7, C.4.3, C.8.6**

Scope/Sequence

Course: 8th Grade Technology Education

Unit: FLUID POWER (Hydraulics) Time - 1 Week

Technology Education
State Standards Addressed: A.8.2, A.8.3, B.8.1, B.8.2, B.8.3, B.8.4, D.8.2

CONTENT:

1. Definition of fluid power - Transmitting energy through the motion of a liquid or gas

2.Fluid power laws
   - 2.1 Fluids power includes liquid AND gas
   - 2.2 Have no shape of their own
   - 2.3 Fluids apply equal pressure in all directions
   - 2.4 Work in Always equals work out

3. Basic types of fluid systems
   - 3.1 Pneumatics - Systems that use gas (air)
   - 3.2 Hydraulics - Systems that use (liquids)

4. Advantages and Characteristics of Fluid power
   - 4.1 Increases ability to do work
   - 4.2 Flexibility and mobility
   - 4.3 Compactness
   - 4.4 Self-cooling/lubricating

5. Mechanical Advantage
   - 5.1 Ratio of two forces (effort and Load, Input and output)
   - 5.2 Tradeoff between force and distance (small force over a large distance)
   - 5.3 Distance to obtain a large force over a small distance
   - 5.4 Definitions of work, force and area

6. Elements in a fluid power system
   - 6.1 Reservoir
   - 6.2 Pressure source (pump)
   - 6.3 Conductors, (hoses, pipes)
   - 6.4 Actuators (cylinders)
   - 6.5 Control devices (valves)

7. Application
   - 7.1 Lifting and moving objects
   - 7.2 Transmitting force over a long distance

Course: 8th Grade Technology Education

Technology Education
State Standards Addressed: A.8.2, A.8.3, B.8.7, B.8.3, C.8.5, C.8.6

Unit: Robotics — Time – 3 Days

CONTENT:

1. Definition
   - 1.1 Definition - Robot, A machine that can be programmed to do to work.
   - 1.2 Machines are a collection of systems – Electrical, mechanical and fluid devices.
   - 1.3 A programmed series of steps required to perform a task

2. Types of Robotic systems
   - 2.1 Industrial (painting, welding, packaging)
   - 2.2 Mobile (submersible, land handling mines)
   - 2.3 Research (university studies)
   - 2.4 Personal (hobbies, toys)

3. Applications
   - 3.1 Dirty jobs
     - 3.1.A Painting
     - 3.1.B Cleaning
     - 3.1.C Mining
   - 3.2 Dull jobs
     - 3.2.A Packaging
     - 3.2.B Testing
     - 3.2.C Assemble
     - 3.2.D Loading/unloading
   - 3.3 Dangerous
     - 3.3.A Welding
     - 3.3.B Exploration
     - 3.3.C Hazardous material

4 Parts of a Robotic System
   - 4.1 Controller (contains the program software)
   - 4.2 Power supply
   - 4.3 Actuator (the robot itself)

5. Why use Robots
   - 5.1 Extends human potential form boring work.
   - 5.2 Allows for performance of otherwise dangerous tasks.
   - 5.3 Allows for performance of impossible tasks (space, deep underwater)

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Technology Education
State Standards Addressed: A.4.9, A.8.1, A.8.2, A.8.3, A.8.5, C.4.2, C.8.4, D.4.1, D.4.5, D.8.1, D.8.2, D.8.3, D.8.4, D.8.5

Unit: Controlling Technology — Time – 1 Week

CONTENT

1. Foresight - Looking into the future
   - 1.1 Project centered
   - 1.2 Problem centered
   - 1.3 New technology-centered

2. Areas of impact
   - 2.1 Environment
   - 2.2 Social
   - 2.3 Global
   - 2.4 Local

3. Forecasting the future
   - 3.1 Trend analysis
   - 3.2 Trend extrapolation

4. Outcomes of technology
   - 4.1 Anticipated
   - 4.2 Unanticipated

5. Controlling Technology
   - 5.1 Ignore/destroy/create but don't use
   - 5.2 Monopolies
   - 5.3 Destroy it
   - 5.4 Legislate
   - 5.5 Litigate
   - 5.6 Educate
   - 5.7 Other (Individual choice, regulate, industry/Gov. relationships …

6. Diffusion of technology
   - 6.1 Invention stage
   - 6.2 Innovation stage
   - 6.3 Dispersion stage

Course: 8th Grade Technology Education

Technology Education
State Standards Addressed: A.4.1, A.4.4, A.8.1, B.8.1, B.8.4, C.8.2, C.8.5, D.8.4, D.8.5

Unit: Impacts of Technology — Time – 1 Week

CONTENT:

1. Nature of Technology
   - 1.1 Different from Science
   - 1.2 Objects (cars, boats, computers)
   - 1.3 Processes (Inputs, processes, outputs)
   - 1.4 Knowledge
   - 1.5 Activity
   - 1.6 Information
   - 1.7 Areas of Technology
     - 1.7.A Transportation
     - 1.7.B Communication
     - 1.7.C Construction
     - 1.7.D Manufacturing

2. Framework
   - 2.1 Conceptual framework (see Pg. 5 Exploring Technology)

3. Problem solving process
   - 3.1 Define problem
   - 3.2 Set goals and consider limitations
   - 3.3 Gather information
   - 3.4 Brainstorm ideas
   - 3.5 Chooses the best solution
   - 3.6 Carry out
   - 3.7 Evaluate and modify

4. Outcomes of technology
   - 4.1 Constantly changing
   - 4.2 Advances in other fields
   - 4.3 Creation/Elimination of industries (i.e. buggy whips)
   - 4.4 Forecasting (methods)

Course: 8th Grade Technology Education

Technology Education
State Standards Addressed: A.4.8, A.8.2, A.8.3, B.8.5, B.8.6, C.8.2, C.8.5, C.8.6

Unit: Building systems — Time – 6 Weeks

CONTENT:

1. Definitions: Easement, variance, setback, covenant

2. Developer
   - 2.1 Advantage
   - 2.2 Disadvantages

3. Permits (reasons for permits)
   - 3.1 Building
   - 3.2 sanitation

4. Planning and plans of a structure
   - 4.1 Views (Interior, Exterior, Section, Plan)
   - 4.2 Measurements and scale (3/4" scale, 1/4" scale,)
   - 4.3 Design/layout
     - 4.3.A Three area of a home
     - 4.3.B Size relationships
     - 4.3.C Closet/door openings

5. Elements of structure
   - 5.1 Foundations
     - 5.1.A Box, Slab, Column,
     - 5.1.B Concrete (consistency, rebar, forms, anchor bolts)
     - 5.1.C Wood
     - 5.1.D Reinforced Styrofome
   - 5.2 Flooring systems
     - 5.2.A Joists, Plates, Plywood
   - 5.3 Wall systems
     - 5.3.A Studs, Jack studs, Headers, Plates

6. Building materials
   - 6.1 Synthetic (Composite material and recycled material)
   - 6.2 Natural (Wood, steel, other)

Course: 8th Grade Technology Education

Technology Education
State Standards Addressed: A.4.2, A.4.4, A.8.1, A.8.2, A.8.3, A.8.7, B.4.6, B.4.7, B.8.1, B.8.6, B.8.7, C.4.3, C.8.6

Unit: Materials Processing Time – 2 Weeks

Content:

1. Source and use of plastic, metal, wood
   1.1 Each material has its own non tangible characteristics

2. Characteristics of material
   2.1 Stiffness
   2.2 Ductility
   2.3 Brittleness
   2.4 Hardness
   2.5 Elasticity
   2.6 Stability
   2.7 Electrical conductivity
   2.8 Thermal conductivity
   2.9 Magnetism .

3. Material selection
   3.1 By the intended use
   3.2 Economics
   3.3 Esthetic value

4. Cutting material
   4.1 Shearing
   4.2 Sawing
   4.3 Induced fracture

5. Processing Plastics

   5.1 Types of plastics
   5.2 Plastic selection
   5.3 Thermal forming
   5.4 Injection molding

6. Processing Metals

   6.1 Types of metal working

6.1.A Casting
6.1.B Wrought metal
6.1.C Shaping
6.1.D Stamping
6.1.E Welding

7 Advantages/disadvantages of each
7.1 Intricate shapes
7.2 Mass production
7.3 Large objects

8 Properties of metal
8.1 Ferrous
- Steel
- Cast iron

8.2 Non ferrous metals
8.3 Carbon content
8.4 Alloys
8.5 Melting point
8.6 Elasticity
8.7 Electrical conductivity

Welding/Casting

9 History See Practical welding Chapter 20

10 Principal of the process
10.1 Electricity jumps a gap (1/16 – 1/8 “)
10.2 Heat produced (10,000 – 12,000

11 Types of welding
11.1 Oxy-Acetylene
11.2 Arc, Mig Tig welding

12. Principal Items effecting welding
12.1 Strength of the current
12.2 Length of the arc
12.3 Angle of the electrode
12.4 Speed of travel
12.5 Thickness of the metal

13. Principal parts
13.1 Electrode
13.2 Chemical coating (Insulates, stabilize the arc, core melts faster)
13.3 Power source (scale for power)
13.4 Ground cable,

13.5 Electrode cable
13.6 Work piece

14 Welding process
14.1 Scratch/tapping
14.2 Angle of electrode
14.3 Weave pattern
14.4 Setting the power level

15 Casting
15.1 Methods of casting
15.2 Melting points
15.3 Procedure

Safety

16 Personal protection
16.1 Clothing – leather, helmet with shade, safety glasses
16.2 Screens – for others
16.3 Ventilation
16.4 No combustible material nearby
16.5 Check cables, - good condition, grounded, electrode cable NOT touching metal

Course: 8th Grade Technology Education

Unit: Engineering Time – 3 Weeks

Technology Education
State Standards Addressed: A.8.2, A.8.3, B.8.3, B.8.4, B.8.6, C.8.2, C.8.5, C.8.6

CONTENT:

1. Why take time to properly engineer/plan project
   1.1Stronger, lighter, cheaper

2. Tension vs. Compression
   2.1 Pulling force
   2.2 Pushing force

3. Shapes
   3.1 Squares
   3.2 Triangles

4. Cross supports
   4.1 Ridged
   4.2 Non-ridged

5. Beams & columns
   5.1 Transfer of weight
   5.2 Factors effecting beam strength
      5.2.A Shape
      5.2.B Size
      5.2.C Span
      5.2.D Material
      5.2.E Types of joints
      5.2.F Type of load (Live, Dead)
      5.2.G Quality of material

6. Joining beams
      6.1 Types of joints (Butt, dado, rabbitt, cross lap, end lap, miter,)

Course: 8th Grade Technology Education

Unit: Manufacturing / Engineering Time – 3 Weeks

Technology Education
State Standards Addressed: A.8.2, A.8.3, B.8.1, B.8.3, B.8.6, B.8.7

CONTENT:

1. Technological Design
   - 1.1 Output – process- output
   - 1.2 Problem solving process

2. Research (what to consider)
   - 2.1 Aerodynamics
   - 2.2 Friction (contact area)
   - 2.3 Force
   - 2.4 Mass
   - 2.5 Drag
   - 2.6 Surface effects
   - 2.7 Momentum

3. Design
   - 3.1 Form and function
   - 3.2 Working drawing
     - 3.2.A Views (front, side, top)
     - 3.2.B Lines & Dimensions (extension, dimension, visible, hidden, center)

4. Manufacturing process
   - 4.1 Prototype
   - 4.2 Production
   - 4.3 Evaluation

5. Safety
   - 5.1 Machine safety (band saw, disk sander, drill press)
   - 5.2 Hand tool safety
   - 5.3 Personal (safety glasses)