Applied Technology   TECHNOLOGY EDUCATION

   Applied Technology is a course developed for high school students to experience engineering principles in a practical setting. It will allow students to prepare for the rigors of performing in a technological society. Students selecting this course need to be somewhat self-motivated as the modular approach requires students to move at their own pace within time constraints. As a general measure of preparedness a student should have successfully completed Algebra I and Freshman Science. The instructor will reserve the right to final consideration for gaining admission to this class.

   Students are actively involved in modules that use computers, tools, materials, problem solving skills, and the design process. By rotating through individual modules, students master the technical skills and procedural techniques necessary for competent operation of each piece of equipment. Once the students are comfortable with the basics, challenge activities emphasize and develop the principles in a variety of applications.

Objectives:
At the completion of this course students will be able to understand and apply:
- Problem solving strategies to meet a variety of design specifications through the research and design module
- The importance of automation and recognize how computer-controlled processes have greatly enhanced our lives through the control technology module
- The history, terminology, and principles of aerodynamics through the aerodynamics module
- The procedures engineers use when designing and constructing a variety of structures, as well as theories behind those procedures through the structural engineering module
- The principles of flight while constructing aircraft, experiencing flight using the flight simulator and testing hand made airplane models through the aviation technology module
- The programming of a robot to perform various tasks and understand the importance of the multitude of uses robots have in our society through the robotics technology module
- The effects of manufacturing technology; create CNC programs using coordinating systems, basic math, and common programming codes; operate the SpectraLight™ Lathe safely and efficiently while creating parts/projects through the CNC Lathe technology module
- The effects of manufacturing technology; create CNC programs using coordinate systems, basic math, and common programming codes; operate the SpectraLight™ Mill safely and efficiently while creating parts/projects through the CNC Mill technology module
- The importance of graphic communication while creating and cutting out a business portfolio cover to be applied to a notebook through the graphic communication technology module
- The functions of computers and the impact of computers in our society through the computer applications technology module
- Basic electronics principles and concepts through the NIDA electronics technology module
- Basic house wiring and plumbing procedures and practices through the electrical and plumbing technology module

Instructional Methods:
   Lectures, demonstrations, laboratory activities, cooperative learning, discussion, individualized tutoring, peer instruction and mentoring within a modular technology education lab. The Applied Technologies course uses selected modules to deliver instruction. All selected modules are in process simultaneously. Each module is designed as a 15-activity, self-paced module that can be completed by either one or two students. Twenty-four students can complete up to 12 modules each during a typical 180-day school year course setting with 45-60 minute periods.

Instructional Materials:
   Twelve individual modules and their related equipment, software and hardware and basic supplies appropriate to each unit, student manuals for each module, computer network and integrated classroom management and testing software.

Credits: 1.0 Carnegie Unit

Course Schedule: Full year, one period per day and five days a week. (180 periods of 45-60 minute duration)

Topics Covered:

Research & Design Technology	Control Technology
Aerodynamics Technology	Structural Engineering Technology
Aviation Technology	Robotics Technology
CNC Lathe Technology	CNC Mill Technology
Graphic Communications Technology	Computer Applications Technology
Basic Electronics Technology	Electrical & Plumbing Technology

Instructional Strategies for CAPT Improvement

As student performance is an increasing emphasis in our schools today, particularly as it is measured by the CAPT, there are several references to how this course may contribute to student performance on the CAPT. Many of the instructional strategies typically used in technology education classes follow the open-ended, problem-solving model that is a key element of many CAPT sections. As the instructor of this technology education course, it is important for you to demonstrate your contributions to the student's growth and performance on such a significant measure. The following are some instructional practices (taken from the SDOE Web page on CAPT) that will support student performance on the CAPT:

1. Having students apply their academic skills to realistic problems and current issues.

2. Consistently having students explain their reasoning orally and in writing.

3. Regularly presenting students with open-ended problems that have a variety of appropriate solutions.

4. Giving students opportunities to apply knowledge and skills in an interdisciplinary context.

5. Requiring students to use higher-order thinking skills throughout K-10 programs as developmentally appropriate.

6. Encouraging students to communicate their ideas effectively.

7. Motivating students to be curious, engaged and cooperative learners

The Applied Technology course is intended to have a career focus, enabling students to begin to visualize and formulate their own career objectives. It is intended that these skill requirements be used in conjunction with the competencies within the units as the students complete this course. They are provided for the instructor as stimuli to include these skills in the pursuit of completing the course through assignments and projects. As the instructor, it is your responsibility to set the focus through your perception of the objectives and your means of evaluation of the student's progress. As you incorporate the skills contained in these lists into your lesson plans and daily focus, you will bring attention to them and contribute to their being developed in your students. Those listed with a "Y" in the CAPT column are skills measured on the CAPT test. The most significant objectives and competencies are those listed within the units themselves, but each of these are listed here because they relate and can be incorporated into the process of delivering and developing each unit.

Connecticut's School-to-Career Core
Academic and Employability Skill Requirements
For All Eight Clusters
Related to CAPT Test

Academic Skills

	CAPT		CAPT
Language Skills-Reading		**Mathematics**	
Locate and use reference materials	Y	Add, subtract, multiply and divide whole	Y
Sequence information	N	numbers, decimals, fractions & mixed numbers	Y
Compare and contrast information	Y	Convert decimals, fractions, ratios & percentages	Y
Interpret technical documents, manuals and tables	Y	Conduct linear, area, volume capacity & weight measurements	Y
Identify main and subordinate ideas	Y	Calculate ratios and proportions	Y
Cross-reference information	Y	Estimate to nearest whole numbers	Y
Follow directions to achieve an objective	Y	Apply statistical principles	Y
Identify cause and effect relationships	Y	Apply algebraic principles	Y
Draw conclusions from facts	Y	Apply geometric principles	Y
Predict consequences	Y	Identify trends from data	Y
Interpret abbreviations, symbols and graphs	Y	Create and interpret tables and graphs	Y
		Use calculator	Y

	CAPT
Language Skills-Writing	
Organize and relate ideas	Y
Develop preliminary outline	Y
Use standard grammar and punctuation	Y
Create clear memos and letters	Y
Proofread and edit	Y
Complete forms and applications	N
Take notes	Y
Create and interpret graphs and charts	Y

	CAPT
Sciences	
Demonstrate basic understanding of biology	Y
Demonstrate basic understanding of chemistry and physics	Y

	CAPT
Communications Skills	
Exchange ideas	Y
Ask and answer questions	Y
Organize and express directions in logical sequence	Y
Convey thoughts upward, downward and laterally	Y

	CAPT
Thinking-Problem-solving Skills	
Conceive ideas	Y
Formulate problems	Y
Identify key information pertinent to problems	Y
Draw conclusions from information	Y
Predict outcomes	Y
Develop an action plan	N
Evaluate impact of solution	N

Applied Technology

TECHNOLOGY EDUCATION

Communications Skills - continued	CAPT	Computer Knowledge	CAPT
Comprehend ideas and instructions	Y	Operate a personal computer	N
Follow directions to achieve an objective	Y	Have keyboarding skills	N
Use appropriate body language	Y	Use wordprocessing software	N
Distinguish between relevant and irrelevant information	Y	Use specialized software	N
Identify cause and effect information	Y	Use database software	N
Infer meaning	Y	Use CD-ROMS	N
Draw conclusions	Y	Establish document storage	N
Predict consequences	Y	Use computer communication	N
Apply data analysis to job tasks	Y	Use computers to format	N
Demonstrate interviewing skills	Y	Use computer bookkeeping	N
Demonstrate telephone skills	N	Enter simple data	N
		Apply computers to job tasks	N

Employability Skills

Not Measured By CAPT

Personal Attributes
Takes initiative
Assumes responsibility
Displays a good self-concept
Persists until job is done
Works well without supervision
Takes responsibility for production/quality
Conflicts do not impede performance
Seeks new challenges
Applies ethics to behavior
Responds well to criticism
Maintains a professional image
Works well under stress
Displays positive behaviors
Follows instructions
Adheres to code of conduct

Team Work
Works effectively in a team
Follows instruction
Takes initiative
Provides support to others
Fosters innovation
Manages relationships

Adaptability
Accepts changes
Performs multiple assignments
Shows flexibility
Adjusts style to the situation
Handles multiple tasks simultaneously
Adapts skills to new tasks

Customer Service Skills
Adopt a customer service orientation
Gather information from various sources to identify prospective customers/markets
Communicate with customer in a professional manner
Maintain accurate and complete information about customers
Document and process customer information/orders
Interpret customer information to identify needs
Offer options to problems and negotiate solutions
Show customers how to implement plan and take action whenever necessary
Monitor implementation plan and take action whenever necessary
Identify new customer needs
Inform customer when needs cannot be met
Make alternate recommendations
Analyze customer feedback to improve internal customer support process

Connecticut Frameworks Performance Standards by Unit			
Content Standards	**Unit 1**	**Unit 2**	**Unit 3**
1 Economics			
2 Technological Impacts	TE4:2f ; TE8:2g ; TE12:2b	TE4:2f ; TE8:2g ; TE12:2b	TE4:2f ; TE8:2g ; TE12:2b
3 Career Awareness	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f
4 Problem Solving/Research and Development	TE8:4k ;TE12:4c ; TE12:4h	TE8:4k ;TE12:4c ; TE12:4h	TE8:4k ;TE12:4c ; TE12:4h
5 Leadership	TE12:5a ; TE12:5b	TE12:5a ; TE12:5b	TE12:5a ; TE12:5b
6 Materials and Processes	TE4:6d ;TE8:6d ; TE12:6b	TE4:6d ;TE8:6d ; TE12:6b	TE4:6d ;TE8:6d ; TE12:6b
7 Communications Systems	TE4:7c ; TE12:7g	TE4:7c ; TE12:7g	TE4:7c ; TE12:7g
8 Production Systems		TE8:8a ; TE12:8a ; TE12:8n	
9 Transportation Systems	TE8:9c ; TE8:9f ; TE12:9a ; TE12:7c		TE12:9b
10 Enterprise	TE12:10f	TE12:10f	TE12:10f
11 Engineering Design	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c

Connecticut Frameworks Performance Standards by Unit			
Content Standards	**Unit 4**	**Unit 5**	**Unit 6**
1 Economics			
2 Technological Impacts	TE4:2f ; TE8:2g ; TE12:2b	TE4:2f ; TE8:2g ; TE12:2b	TE4:2f ; TE8:2g ; TE12:2b
3 Career Awareness	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f
4 Problem Solving/Research and Development	TE8:4k ;TE12:4c ; TE12:4h	TE8:4k ;TE12:4c ; TE12:4h	TE8:4k ;TE12:4c ; TE12:4h
5 Leadership	TE12:5a ; TE12:5b	TE12:5a ; TE12:5b	TE12:5a ; TE12:5b
6 Materials and Processes	TE4:6d ;TE8:6d ; TE12:6b	TE4:6d ;TE8:6d ; TE12:6b	TE4:6d ;TE8:6d ; TE12:6b
7 Communications Systems	TE4:7c ; TE12:7g	TE4:7c ; TE12:7g	TE4:7c ; TE12:7g
8 Production Systems	TE8:8f ; TE12:8c ; TE12:8k		TE8:8b ; TE12:8n ; TE12:8q ; TE12:8s
9 Transportation Systems		TE8:9d ; TE12:9a ; TE12:9b	
10 Enterprise	TE12:10f	TE12:10f	TE12:10f
11 Engineering Design	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c

Connecticut Frameworks Performance Standards by Unit			
Content Standards	**Unit 7**	**Unit 8**	**Unit 9**
1　Economics			
2　Technological Impacts	TE4:2f ; TE8:2g ; TE12:2b	TE4:2f ; TE8:2g ; TE12:2b	TE4:2f ; TE8:2g ; TE12:2b
3　Career Awareness	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f
4　Problem Solving/Research and Development	TE8:4k ;TE12:4c ; TE12:4h	TE8:4k ;TE12:4c ; TE12:4h	TE8:4k ;TE12:4c ; TE12:4h
5　Leadership	TE12:5a ; TE12:5b	TE12:5a ; TE12:5b	TE12:5a ; TE12:5b
6　Materials and Processes	TE4:6d ;TE8:6d ; TE12:6b	TE4:6d ;TE8:6d ; TE12:6b	TE4:6d ;TE8:6d ; TE12:6b
7　Communications Systems	TE4:7c ; TE12:7g	TE4:7c ; TE12:7g	TE12:7a ; TE12:7b ; TE12:7c ; TE12:7d; TE12:7g
8　Production Systems	TE8:8a ; TE8:8b ; TE8:8c ; TE12:8n ; TE12:8q ; TE12:8r ; TE12:8s	TE8:8a ; TE8:8b ; TE8:8c ; TE12:8n ; TE12:8q ; TE12:8r ; TE12:8s	
9　Transportation Systems			
10　Enterprise	TE12:10f	TE12:10f	TE12:10f
11　Engineering Design	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c

Connecticut Frameworks Performance Standards by Unit			
Content Standards	**Unit 10**	**Unit 11**	**Unit 12**
1 Economics			
2 Technological Impacts	TE4:2f ; TE8:2g ; TE12:2b	TE4:2f ; TE8:2g ; TE12:2b	TE4:2f ; TE8:2g ; TE12:2b
3 Career Awareness	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f	TE8:3i ;TE12:3a ; TE12:3b ; TE12:3e ; TE12:3f
4 Problem Solving/Research and Development	TE8:4k ;TE12:4c ; TE12:4h	TE8:4k ;TE12:4c ; TE12:4h	TE8:4k ;TE12:4c ; TE12:4h
5 Leadership	TE12:5a ; TE12:5b	TE12:5a ; TE12:5b	TE12:5a ; TE12:5b
6 Materials and Processes	TE4:6d ;TE8:6d ; TE12:6b	TE4:6d ;TE8:6d ; TE12:6b	TE4:6d ;TE8:6d ; TE12:6b
7 Communications Systems	TE4:7c ; TE8:7d ; TE8:7g ; TE12:7g	TE4:7c ; TE12:7g	TE4:7c ; TE12:7g
8 Production Systems		TE12:8j	
9 Transportation Systems			
10 Enterprise	TE12:10f	TE12:10f	TE12:10f
11 Engineering Design	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c	TE4:11a ; TE4:11b ; TE8:11a ; TE8:11b ; TE12:11a ; TE12:11c

Unit 1   Research & Design Technology

In this module/unit students will use research and design principles and problem solving strategies to solve several challenges or problems dealing with vehicles made of different materials and designs. The students will have hands-on experience in solving problems, researching, designing, and constructing several different vehicles and different systems used in the vehicles.

Content Outline:
> Engineering problem-solving process
> History of Design
> Vehicle systems
> Designing vehicle systems
> Testing designs

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Discover terminology and labeling of research and design techniques
- Define the steps to the beginning process of designing your index card vehicle
- Discover some of the many drawings designers use to communicate from
- Develop an understanding of the problem solving technique
- Discover the brief history of design in industry
- Utilize the Auto Insight software program to learn more about automobiles
- Discover how shock absorbers work
- Explore the animation on front suspension
- Design and develop a vehicle that is powered by a mousetrap
- Discover some of the material used in developmental work
- Design and research the best possible material for a bumper system
- Continue to develop a system that will reduce a model vehicle's impact into a stationary object
- Research and test various substances used in a suspension modification for a model vehicle

Instructional Materials:
> Applied Technologies Research and Design Module Student Guide
> Compton's *Interactive Encyclopedia* (CD)
> Media Cruiser (CD)
> *Auto Insight* software
> ***Design and Problem Solving in Technology*** text
> Odyssey Educational System Vehicle Impact System manual, kit, and software
> Odyssey Educational System Vehicle Suspension System manual, kit, and software
> Pack of 3.5" x 5" index cards
> Tape dispenser with tape
> Scissors
> Mousetrap Vehicle kits

Activities:
- Design and build an index card vehicle
- Research about Automobiles
- Design, build and test a vehicle powered by a mousetrap
- Research, design, build and test model impact reduction devices

Unit 2   Control Technology

   The Control Technology Module is designed as a 15-activity, self-paced module that can be completed by either one or two students. The module involves the study of automation and how it has increased productivity and efficiency in the manufacturing industry. Students will build multiple K'NEX models and control them with the *TechnoK'NEX control* software.

Content Outline:
> Technological Systems
> Automation
> Sensor systems
> Logic Systems
> Quality control

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Discover the parts of a system
- Define automation
- Discover the century when fully automated systems were developed
- Meet Scottish inventor James Watt and identify his early feedback control mechanism invention
- Identify the five components of automated systems
- Recognize what electronic systems do
- Identify photons
- Discover some of the physical phenomena sensors can detect
- Read about open loop process control
- Create an open loop process control system using K'NEX modeling pieces, hardware, and software
- Construct a revolving door that at is activated using a light sensor and that stops rotating after five rotations
- Troubleshoot the program
- Discover and use the Reset Sensor icon
- Discover a career in electrical engineering
- Discover logic elements and define associated words
- Recognize how logic is used in programming automated systems
- Complete a truth table
- Develop a program that will sound an alarm three times if first the Light Sensor reaches 30 or below then the Touch Sensor is activated
- Discover the OR and NOT logic functions
- Recognize how automation is helping the automobile industry
- Read how CAD/CAM has increased productivity in manufacturing industries
- Discover which industry leads in the employment of automatic control apparatus
- Identify the frequency with which humans need to make adjustments in modern petroleum control rooms
- Find out who triggered a revolution in automated car making.
- Discover who W. Edwards Deming was
- Recognize the importance of quality control and define words associated with it
- Experiment with the remaining *TechnoK 'NEX* icons not previously used: Reverse Direction and Flash
- Read about the career of a mechanical engineer
- Discover what a design loop is and how it's used
- Begin developing a system using K' NEX and *TechnoK'NEX,* based on certain parameters
- Begin completing the Design Loop Work Sheet in congruence with your system
- Complete the K'NEX system based on parameters outlined in Activity Seven.
- Complete the Design Loop Work Sheet that goes with your K'NEX system.
- Read about advantages and disadvantages of automation

- Begin the Challenge Section

Instructional Materials:
Applied Technologies Control Technology Module Student Guide
Design and Problem Solving in Technology text
K'NEX kit including *TechnoK'NEX* software, and assorted inputs, outputs, and Leonardo Interfaces
Compton's *Interactive Encyclopedia* CD
Media Cruiser
AA batteries

Activities:

- Create an open loop process control system using K'NEX modeling pieces, hardware, and software
- Construct a revolving door that at is activated using a light sensor and that stops rotating after five rotations
- Complete a truth table
- Develop a program that will sound an alarm three times if first the Light Sensor reaches 30 or below then the Touch Sensor is activated
- Complete a truth table
- Experiment with the remaining *TechnoK 'NEX* icons not previously used: Reverse Direction and Flash
- Read about the career of a mechanical engineer
- Develop a system using K' NEX and *TechnoK'NEX,* based on certain parameters
- Complete the Design Loop Work Sheet in congruence with your system
- Read about advantages and disadvantages of automation

Unit 3   Aerodynamic Technology

     The Aerodynamics Module is designed as a 15-activity, self-paced module that can be completed by either one or two students. In this module, students will actively investigate and test the effects of air on stationary and mobile objects, as well as the effects that stationary and mobile objects have on air. They will also become familiar with the history and mechanics of flight and fluid dynamics.

Content Outline:
Aerodynamics
Hydrodynamics
Vehicle design for desired results
Bernoulli's Principle
Newton's Third Law
Wind Tunnel use
Testing airfoils for lift and drag

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Define aerodynamics and determine how long it's been studied
- Define hydrodynamics and discover which part of a boat one should focus when trying to increase the vessel's speed and efficiency
- Discover unique difference between the properties of air and water.
- Recognize the affects wind can have on sand dunes
- Identify the molecules that make up air
- Discover what causes wind
- Define and describe the characteristics of pressure waves
- Define and describe the characteristics of viscosity
- Define and describe the characteristics of streamlines
- Identify the impact form drag has on an object
- Experiment with various test shapes using the Applied Technologies AeroDyne Wind Tunnel
- Discover aerodynamic terms and principles as they relate to automobile design
- Construct and test various vehicle shapes in the Applied Technologies AeroDyne Wind Tunnel
- Explain how an aerodynamically designed vehicle helps make the fuel usage more efficient
- Determine how air reacts at different speeds
- Recognize why pilots don't fly at mach speed
- Discover what Richard Kline's paper airplane does when thrown, and why this is significant
- Discover careers associated with aerodynamics
- Identify the forces that a plane must overcome in order for it to become airborne
- Define Bernoulli's Principle and Newton's Third Law
- Recognize how air flows over an airfoil
- Discover what happens when an airfoil is placed at an incline
- Discover some of the characteristics that help a bird fly
- Identify Dr. Richard Whitcomb' 5 contribution to aircraft design
- Test three airfoils in the wind tunnel, using various wind speeds and angles of attack, and record those findings on a work sheet
- Identify what makes the Kline-Fogleman airfoil so radical
- Discover why the Kline-Fogleman airfoil has been so ignored by the mainstream aircraft industry
- Recognize other industries where design elements similar to that of the Kline-Fogleman airfoil are being used
- Make one of the paper airplanes featured in *The Ultimate Paper Airplane* text and test it when instructed
- Design at least three original airfoils profiles, then select one to make
- Trace and cut out seven "ribs" of the selected airfoil shape that include cross member and backbone reliefs

- Cut the necessary number of cross members and the backbone from balsa wood, following specified dimensions
- Bag, label, and store the parts so they can easily be identified and accessed for the next activity
- Complete construction of your original airfoil, including sealing the skeleton with Monokote plastic and attaching the test mount bracket
- Run tests on the airfoil in the wind tunnel as instructed in The Personal Airfoil Test Work Sheet
- Discover the various uses and kinds of wind turbines and why they 'reused
- Construct a wind turbine blade and test the amount of power it generates at various speeds in the wind tunnel

Instructional Materials:

Applied Technologies Aerodynamics Module Student Guide	Media Cruiser (CD)
Compton's *Interactive Encyclopedia*	Wooden airfoils set (3)
Shopware *Multimedia Aerodynamics Part I and II* (CD s)	Modeler's seaming iron
Applied Technologies AeroDyne Wind Tunnel	Test mount bracket
Wooden shapes set (round, square, elliptical, triangular)	Digital multimeter
Vehicle shapes set (sedan, sports car, pickup truck, semi tractor)	Airfoil jigs
Roll of heat sensitive plastic modeling skin	X-Acto® modeling knife
Balsa wood sticks set (1/8" x 1/8" x 36")	Pack of sandpaper
Balsa wood stick set (triangular 36")	Ruler
Balsa wood stick set (tapered 36")	Modeling glue
Wind turbine assembly (with motor and leads)	Can of cooking spray
Box of Zip-Lock® bags	Set of assorted screws

Activities:

- Experiment with various test shapes using the Applied Technologies AeroDyne Wind Tunnel
- Construct and test various vehicle shapes in the Applied Technologies AeroDyne Wind Tunnel
- Test the effects of air on stationary and mobile objects
- Test three airfoils in the wind tunnel, using various wind speeds and angles of attack, and record those findings on a work sheet
- Make one of the paper airplanes featured in *The Ultimate Paper Airplane* text and test it when instructed
- Design at least three original airfoils profiles, then select one to make
- Trace and cut out seven "ribs" of the selected airfoil shape that include cross member and backbone reliefs
- Cut the necessary number of cross members and the backbone from balsa wood, following specified dimensions
- Bag, label, and store the parts so they can easily be identified and accessed for the next activity
- Complete construction of your original airfoil, including sealing the skeleton with Monokote plastic and attaching the test mount bracket
- Run tests on the airfoil in the wind tunnel as instructed in The Personal Airfoil Test Work Sheet
- Construct a wind turbine blade and test the amount of power it generates at various speeds in the wind tunnel

Unit 4   Structural Engineering Technology

   The Structural Engineering Module is designed as a 15-activity, self-paced module that can be completed by either one or two students. The module is an introduction to structural engineering. Students will learn how to design and build trusses, bridges, and towers that will carry a load. They will also cover the history of engineering principles. They will take existing structures and learn to modify them to make them more efficient.

Content Outline:
Structural Design
Engineering Design Principles
Types of loads
Trusses
Types of bridges
Structural elements of towers and buildings

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Discover how adding one piece of material can make a structure significantly stronger
- Define structure and identify key elements in a structure's design
- Consider why structural systems fail
- Explore what a safety factor is and how it is built into products
- Apply the safety factor formula to a given problem
- Explore the history and importance of engineering principles
- Identify the differences between a live and dead load
- Describe the four different elements that affect a structure
- Define engineering and offer examples of branches of engineering
- Describe what a civil engineer does
- Consider the five stresses that can affect a structure and its material
- Discover the importance of a structure's thrust line
- Use software to illustrate how members of a structure are affected when placed in compression and tension
- Use the steps of the design process to solve a challenge
- Build an index card structure that is able to hold at least 10 pounds of weight
- Document and describe how various steps of the design process were implemented during the challenge
- Explore the history and tremendous importance of the beam and truss
- Discover why a truss is so strong
- Identify the stresses applied to a truss or beam
- Use *ModelSmart to* build three examples of trusses
- Analyze and document the breaking load and structural weight of the three trusses
- Calculate the efficiency of the three trusses and determine which one is the strongest
- Define efficiency
- Use K'NEX to build the three trusses
- Analyze and document the breaking load and structural weight of the three trusses
- Calculate the efficiency of the three trusses and determine which one was the most efficient
- Answer questions based on last activity's data between trusses built in ModelSmart with balsa wood and the data collected with the K'NEX trusses tested using the Load Star 2000
- Use software to learn about the history of bridges
- Identify the four types of arch bridges (deck, half-through, through, and bow string)
- Discover the three types of beam bridges (girder, cantilever, and truss)
- Read about the two types of tension bridges (suspension and cable-stayed)
- Use K'NEX to build a bridge
- Recognize the various parts of a building

- Explore various ways to build a tower for strength and efficiency
- Examine the structural elements of the arch
- Identify what gives materials their strength
- Discover the importance and use of prestressing
- Use ModelSmart to construct an arched bridge, which will help reinforce the advantages of arches

Instructional Materials:

Applied Techs Structural Engineering Module Student Guide   LoadStar 2000
Design and Problem Solving in Technology text   Media Cruiser (CD)
Compton's *Interactive Encyclopedia* (CD)   *ModelSmart* software
Postal scale   Pack of 3x5 index cards
Cutting jigs   Cutting mats
Pair of scissors   Rulers
KNEX Comprehensive Bridge Building Set including K'NEXprint and K'NEX bridge ideas cards
Multimedia Engineering Technology: Bridge Building Part J & 2 software (2 CDs)
Miscellaneous supplies (balsa wood, graph paper, rubber bands, straight pins, glue, foam boards, etc.)

Activities:

- Apply the safety factor formula to a given problem
- Design and build trusses, bridges, and towers that will carry a load
- Take an existing structure and learn to modify it to make it more efficient
- Build an index card structure that is able to hold at least 10 pounds of weight
- Use *ModelSmart to* build three examples of trusses
- Analyze and document the breaking load and structural weight of the three trusses
- Use K'NEX to build the three trusses
- Analyze and document the breaking load and structural weight of the three trusses
- Calculate the efficiency of the three trusses and determine which one is the strongest
- Answer questions based on last activity's data between trusses built in ModelSmart with balsa wood and the data collected with the K'NEX trusses tested using the Load Star 2000
- Use K'NEX to build a bridge
- Use ModelSmart to construct an arched bridge, which will help reinforce the advantages of arches

Unit 5   Aviation Technology

Aviation is the study of how the four forces affect flight. In this module, students will learn history and principles, and study the careers related to flight. The students will have hands-on experience with flight principles and applications while constructing aircraft, using the flight simulator, and testing paper airplanes. The students will study flight by constructing aircraft, reading, viewing videos and flying an aircraft on the flight simulator.

Content Outline:
Bernoulli's principle
Types of aircraft
Four forces of flight
Mechanics of flight control
Navigation and flight planning

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Define Bernoulli's Principle
- Explore pioneers in the field of aviation
- Identify different types of aircraft
- Define aerodynamics
- Explore the four forces of flight
- Develop an understanding of the First Law of Motion
- Identify angle of attack
- Discover how wings generate lift
- Explore how a plane reacts in a flight environment
- Determine preflight preparations
- Define control surfaces
- Experiment with control surfaces by constructing a paper airplane and attempting a simulated flight with *Flight Simulator 98*
- Determine specific control instruments and their functions
- Define controls and functions of the Flight Sim 1000 and the rudder pedals
- Explore and attempt proper taxi procedures
- Explore and attempt correct climb and altitude adjustment procedures
- Use different controls for changing viewpoints and accessing checklists
- Experiment with airplane performance by constructing a paper airplane and testing it
- Discover different systems of navigation
- Use VOR navigation to track a signal in a *Flight Simulator 98* situation
- Investigate design procedures while constructing a balsa glider
- Determine and attempt proper landing procedure in *Flight Simulator 98*
- Define VFR flight
- Explore the use of maps and charts in navigation
- Plot a course from Meigs Field and Starke County
- Select checkpoints for an intended course
- Determine the effect of wind on an aircraft's intended course and find the correction angle
- Determine ETE of a plotted course
- Fill out a pilot's navigation log
- Re-plot a course of flight
- Retrieve pertinent information from a weather briefing
- Find correct information for the intended flight and fill out the navigation log accordingly
- Fill out a flight plan for the intended flight and file it with the instructor

- Fly the plotted course using correct procedure

Instructional Materials:

Applied Technologies Aviation Module Student Guide	Media Cruiser (CD)
Discover Aerodynamics with Paper Airplanes text (Schmidt)	Navigational plotter
Chicago Sectional Aeronautical Chart	
Compton's *Interactive Encyclopedia* (CD)	CSG slide flight computer
Microsoft Flight Simulator 98 software	Flight Simulator Controller
Glue Gun	Scissors
Cutting Mats	12" Rulers
X-Acto Knives	Bottles of White Glue
1/8" X 3" *X* 36" balsa sheets	Chicago VFR Terminal Area Chart

Activities:

- Experiment with control surfaces by constructing a paper airplane and attempting a simulated flight with *Flight Simulator 98*
- Explore and attempt proper taxi procedures
- Explore and attempt correct climb and altitude adjustment procedures
- Experiment with airplane performance by constructing a paper airplane and testing it
- Use VOR navigation to track a signal in a *Flight Simulator 98* situation
- Attempt proper landing procedure in *Flight Simulator 98*
- Investigate design procedures while constructing a balsa glider
- Plot a course from Meigs Field and Starke County
- Fill out a pilot's navigation log
- Retrieve pertinent information from a weather briefing
- Find correct information for the intended flight and fill out the navigation log accordingly
- Fill out a flight plan for the intended flight and file it with the instructor
- Fly the plotted course using correct procedure

Unit 6   Robotics

Robotics is the study of how computer controlled, electromechanical devices operate and provide automation services. In this module, students will learn history and principles, and study the careers related to robotics. The students will have hands-on experience with robotics principles and applications while developing complex programs using subroutines and variables to control the robot's actions though the computer. The students will be introduced to linear interpolation as they develop the program and learn how inputs and outputs combined with switches help determine robotic movement.

Content Outline:
Types of robots
Axes of motion
Control programming
Characteristics of computer data
Characteristics of the robot
Linear interpolation
Switching

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Identify the origin of the term "robot."
- Describe the difference between hard automation and soft automation
- Consider the effects servo controls have on a robot
- Identify the attributes of low-, medium-, and high technology robots
- Identify elements that make up a robot
- Define axes
- Identify a robot's axes of motion
- Experience the robot in action
- Command the robot's axes of motion
- Demonstrate knowledge of the robot's axes of movement
- Read about the different ways a robot can be programmed
- Describe the differences between ROM and RAM
- Identify the characteristics of a computer bit
- Discover the amount of basic instructions that are understood by a robot
- Discover the various types of robot arms
- Define working envelope
- Teach the robot the positions needed to complete the "pick and place" task, and write those positions down on a work sheet
- Program the robot to perform the "pick and place" task, based on the previously taught positions
- Name the three ways moving parts of a robot are driven
- Recognize that the slower the robotic motor, the more powerful it generally is
- Describe the characteristics and uses of hydraulic systems used to drive the moving parts of a robot
- Discover that pneumatic systems are usually used to power grippers
- Define linear interpolation
- Teach positions to be used in the drawing program
- Properly use the tools needed to perform the robotic task
- Write a program using linear interpolation
- Troubleshoot that program for problems
- Properly use the tools needed to perform the robotic task
- Identify the use of a light emitting diode
- Discover the widespread use of robots that use sensors to measure differences in heat

- Recognize the characteristics of ultrasonic sensors
- Create a circuit using an SPST switch
- Create a normally open circuit using the limit switch
- Create a normally closed circuit using the limit switch
- Identify ways in which robots are taking the place of humans to perform dangerous work
- Define telechiric devices
- Create an environment whereby the robot will respond to an input, and signal an output per robotic cycle
- Discover what variables and subroutines are
- Begin writing the first part of a program that will use variables and subroutines
- Describe the advantages of variables and subroutines
- Teach the 11 positions needed for this task
- Test and, if necessary, troubleshoot the program.
- Verify that the program does the following things:
    Places blocks according to which limit switch was tripped
    Loops until a block is placed into the parts feeder

Instructional Materials:

Applied Technologies Robotics Technology Module Student Guide	Media Cruiser CD
Eshed Scorbot ER 4pc or ER V robot, controller, and software *Robotics* text	
Applied Technologies Robotic Platform	Slotted screwdriver
Long red, white, and black wire	Metal block
Dry erase marker pack with holder	Sheets of 8 1/2 x 11" paper
Compton's *Interactive Encyclopedia* CD	

Activities:

- Experience the robot in action
- Teach the robot the positions needed to complete the "pick and place" task, and write those positions down on a work sheet
- Program the robot to perform the "pick and place" task, based on the previously taught positions
- Write a program using linear interpolation
- Properly use the tools needed to perform the robotic task
- Create a circuit using an SPST switch
- Create a normally open circuit using the limit switch
- Create a normally closed circuit using the limit switch
- Create an environment whereby the robot will respond to an input, and signal an output per robotic cycle
- Writing a program that will use variables and subroutines

Unit 7   CNC Lathe Technology

The CNC Lathe Module is designed as a 15-activity, self-paced module that can be completed by either one or two students. This module is an introduction to manufacturing and CNC lathe technology. Students will examine how manufacturing technology has increased their standard of living. Students utilize Cartesian coordinate geometry, basic math, and measurement, in order to identify cutting areas. Programs will be developed by the student using common programming codes. Parts will be turned using the lathe.

Content Outline:
Manufacturing
The design engineering process
Computer numerical control (CNC)
Lathe operation
Elements of CNC programming
Cartesian coordinates
Circular interpolation

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Define manufacturing
- Explore the history of tools and machines
- Define numerical control
- Discover how numerical control evolved into CNC
- Examine the importance of manufacturing technology in our world
- Discover what a lathe is and how it is used
- Examine components of the spectraLight lathe
- Determine proper safety precautions when working with a CNC turning (lathe) machine
- Use the proper techniques to setup apiece of stock and initialize for a CNC program
- Create a part using the turning center
- Identify a program
- Define geometry and discover how it relates it to CNC lathe part programming/development
- Find Cartesian coordinates on a grid
- View a presentation on precise measurement
- Explore the role of math in CNC programming
- Recognize how a program is developed
- Identify certain basic programming codes
- Explore the software used for controlling programs
- Develop a basic CNC program
- Verify the CNC program that was developed
- Sketch out a simple part
- Recognize the difference between drawing a part true to size or drawing a part to scale
- Draw a part on graph paper using a 4:1 scale ratio
- Determine correct coordinate points
- Define datum dimensioning
- Explore the idea of multiple pass programming
- Determine how roughing and finishing passes are used
- Develop a multiple pass program
- Define circular interpolation
- Determine what codes are necessary for circular interpolation, both counterclockwise and clockwise
- Develop a program that uses circular interpolation
- Verify your circular interpolation program

- Develop a program that will make a caterpillar part
- Finish developing the Caterpillar part program
- Verify the Caterpillar part program for the instructor
- Create the Caterpillar part using the spectraLight Lathe

Instructional Materials:

SpectraLight Lathe for Windows® software (this is referred to as *CNC Lathe* software)

Applied Technologies CNC Lathe Module Student Guide   ***CNC A First Look Primer*** text
Compton's *Interactive Encyclopedia* CD   Media Cruiser (CD)
Pad 1/10 Graph paper   Rulers
Calculator   Safety glasses
Pieces of machinable wax   CNC Lathe Module

Activities:

- Create a part using the turning center
- Find Cartesian coordinates on a grid
- Develop a basic CNC program
- Sketch out a simple part
- Draw a part on graph paper using a 4:1 scale ratio
- Create the Caterpillar part using the spectraLight Lathe

Unit 8   **CNC Mill Technology**

The CNC Mill Module is designed as a 15-activity, self-paced module that can be completed by either one or two students. This module is an introduction to manufacturing and CNC Mill technology. Students will examine how manufacturing technology has increased their standard of living. Students utilize Cartesian coordinate geometry, basic math, and measurement, in order to identify cutting areas. Programs will be developed by the student using common programming codes. Parts will be milled out.

Content Outline:
Manufacturing
The design engineering process
Computer numerical control (CNC)
Mill operation
Elements of CNC programming
Cartesian coordinates
Circular interpolation and pocketing

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Explore the history of tools and machines
- Define CXC and its uses
- Consider the advantages of present day manufacturing
- Examine the importance of manufacturing technology in our world
- Identify a program
- Define geometry and discover how it relates to CNC milling
- Find Cartesian coordinates on a grid
- View a presentation on precise measurement
- Explore a three-dimensional model showing X, Y, and Z coordinates
- Explore several benefits of CNC technology
- Examine components of the spectraLight Mill
- Identify correct setup procedures for a milling project
- Mill out your first part
- Recognize how a program is developed
- Identify certain basic programming codes
- Explore the software used for controlling programs
- Develop a basic CNC program
- Properly setup the verification of a program
- Explore how each line of a program can be examined during the verification process
- Examine how tool compensation affects the outcome of a part/design
- Develop an understanding of the importance of datum dimensioning in part development
- Define circular interpolation and pocketing
- Determine the codes necessary to create arcs
- Graph and create codes for a program that includes arcs
- Begin developing a program containing circular interpolation
- Explore careers in the manufacturing field
- Identify the stages in the design engineering process
- Determine ways in which mock-ups and prototypes are constructed
- Create a thumbnail sketch of a maze design for prototype purposes
- Datum dimension the maze you are designing
- Identify the stages in the design engineering process.
- Determine ways in which mock-ups and prototypes are constructed

- Create a thumbnail sketch of a maze design for prototype purposes
- Datum dimensions the maze you are designing. 1. Identify the stages in the design engineering process

Instructional Materials:

Applied Technologies CXC Mill Module Student Guide	Media Cruiser (CD)
Manufacturing Technology text	Calculator
SpectraLight Mill System User's Guide text	Chip brush
Compton's *Interactive Encyclopedia* (CD)	Pad of graph paper (1/4 inch)
SpectraLight Milling Machine with controller	Rulers
Pair of safety glasses	Blocks of machinable wax
Mill accessories kit	

Activities:

- Find Cartesian coordinates on a grid
- Mill out your first part
- Develop a basic CNC program
- Properly setup the verification of a program
- Graph and create codes for a program that includes arcs
- Develop a program containing circular interpolation
- Create a thumbnail sketch of a maze design for prototype purposes

Unit 9   Graphic Communication Technology

The Graphic Communication Vinyl Signmaking Module is designed as a 15-activity, self-paced module that can be completed by either one or two students. The module involves the study of graphic communications throughout history and into the present day. Students will utilize a software program in order to see the development of design and layout while completing a business portfolio cover.

Content Outline:
Graphic communication, history and components
The Signmate Express
Designing graphic layouts
Applying graphic design to vinyl sign design

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Discover the process of graphic communication
- Explore the three factors of communication
- Recognize the importance of communication
- Explore the history and components of graphic communication
- Identify the basic components *of SignMate Express®*
- Discover various tools and palettes in *SignMate Express*
- Review the importance of graphic communication
- Discover more tools and palettes in *SignMate Express*
- Explore how graphic communication utilizes verbal and nonverbal communication
- Design signs for various causes without the use of text
- Discover detailed graphics in *SignMate Express*
- Explore the uses of advertisements in graphic communication
- Complete the Pizza Advertisement Work Sheet
- Explore the process of creating vinyl signs
- Complete your first cutting project on the vinyl sign cutter
- Complete the Sticker Work Sheet
- Explore the basic principles of design and layout
- Discover various formats and applications used in graphic communication
- Utilize the techniques of design and layout to create portfolio cover
- Complete the Fund-raiser Banner Worksheet
- Discover the importance and history of font types
- Explore the Text tool in SignMate
- Investigate the applications of proportion and contrast used in the design and layout process
- Discover about rhythm and unity in design and observe how they pertain to layout and design
- Add your business name, mailing and e-mail address, and phone number to your cover portfolio
- Explore the program *Product Manager®* in *SignMate*
- Identify the correct procedure for cutting out and applying vinyl for your business portfolio cover
- Begin the cutting out and application process for your portfolio cover
- Complete the placement of your business portfolio cover on your notebook

Instructional Materials:

Applied Technologies Graphic Communication Vinyl Signmaking Module Student Guide
Vinyl material dispenser   Roland CM 12 desktop vinyl sign cutter
SignMate Express software   Compton's *Interactive Encyclopedia* CD
Roland *Classic Collection Vector Art* CD & Catalog   Media Cruiser (CD)
Roll of application tape   X-Acto knife
Squeegee   Scissors
Ruler   Pair of tweezers
Roll of vinyl material (1 red, 1 blue, 1 black, 1 white) Prong notebook

Activities:

- Design signs for various causes without the use of text
- Complete the Pizza Advertisement Work Sheet
- Complete your first cutting project on the vinyl sign cutter
- Complete the Fund-raiser Banner Worksheet
- Add your business name, mailing and e-mail address, and phone number to your cover portfolio
- Begin the cutting out and application process for your portfolio cover
- Complete the placement of your business portfolio cover on your notebook

Unit 10   **Computer Applications Technology**

    The Computer Applications Module is designed as a 15-activity, self-paced module that can be completed by either one or two students. The module involves the study of some of the components of a computer and a variety of computer programs and tools to help students learn about the widespread use of computers. They will see firsthand ways information can be entered, stored, moved, and used through the use of computers.

Content Outline:
History of computers
Components of a computer system
Operating systems
Introduction to applications; WordPad, Paint, Microsoft Works

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Define computer and supercomputer
- Discover bits and read how they are organized into bytes
- Explore the history of computers
- Consider the categorization of computers
- Identify various components of the system unit
- Consider the kinds of business-related things for which a computer might be used
- Define CPU
- Identify the technological growth of the integrated circuit chip
- Discover the functions and components of RAM, ROM, and silicon chips
- Identify the functions and components of various computer input devices including the keyboard and mouse
- Identify the functions and components of various computer output devices including the monitor, printer, and mode
- Identify various types of permanent data storage including the floppy disk, the hard drive, and the CD-ROM
- Discover what an operating system is, what it does, and examples of operating systems
- Use *WordPad®* to produce a document
- Apply skills to include at least one bold word, one italicized word, and two different fonts to the document
- Print the document
- Consider why a word processor might be an important tool to use in business
- Use *Paint®* to produce a graphic
- Sketch a few designs for a company logo
- Use *WordPad* and *Paint to* create apiece of official-looking letterhead that contains pertinent information
- View an introduction to Microsoft *Works®*
- Define database
- Create a database and form letter
- Edit an existing spreadsheet which includes having to account for profit margin and sales tax
- Explain cost calculations
- Consider ways in which spreadsheets might be used by a business owner

Instructional Materials:
Applied Technologies Computer Applications Module Student Guide
Compton's *Interactive Encyclopedia* (CD)   Media Cruiser (CD)
The New Way Things Work (CD)   Microsoft *Works 2000* software
How Computers Work (millennium edition) text   Communication Technology text

Activities:
- Use *WordPad*® to produce a document
- Apply skills to include at least one bold word, one italicized word, and two different fonts to the document
- Print the document
- Use *Paint*® to produce a graphic
- Sketch a few designs for a company logo
- Use *WordPad* and *Paint to* create apiece of official-looking letterhead that contains pertinent information
- View an introduction to Microsoft *Works*®
- Create a database and form letter
- Edit an existing spreadsheet which includes having to account for profit margin and sales tax

Unit 11   Electrical & Plumbing Technology

The Electrical and Plumbing Module is designed as a 15-activity, self-paced module that can be completed by either one or two students. The module involves the study of shop safety and general shop terms along with the development of electrical and plumbing skills.

Content Outline:
Safety in the workplace
Fire safety
Basic plumbing and electrical tools
Basic electrical theory
House-wiring essentials
Plumbing essentials

Objectives:
At the completion of this course, students will be able to use problem-solving strategies to meet a variety of design specifications as they:
- Define safety
- Consider common causes for injury
- Determine proper procedures for shop preparation, including skill and dress
- Identify safety colors
- Identify focal colors
- Determine proper lifting procedures
- Explore the employer's responsibility for job safety
- Identify common causes of injury
- Designate proper clothing and preparations for entering the shop area
- Identify shop safety colors and local colors
- Draw the fire triangle
- Define the classes of fires
- Explore tools and materials used in the electrical and plumbing trades
- Identify basic plumbing and electrical tools
- Define static electricity
- Determine the nature of electric charge
- Identify atomic charges
- Explore wiring in circuits
- Signify the reasons for using a circuit breaker
- Study switches
- Compare and contrast direct current (DC) and alternating current (AC)
- Explore low power systems
- Differentiate between low power and high power systems
- Identify electrical wiring symbols
- Compare types of electrical circuits
- Determine the number of General Purpose Circuits needed in a home
- Realize the importance of grounding electric current
- Install an electrical grounding rod
- Determine how to connect wires to terminals
- Learn how to prepare cable for connections
- Install wiring and a 15-amp circuit breaker
- Connect a 240-volt dryer outlet
- Identify two methods for splicing wires
- Show which wire connectors are suitable for use
- Install a receptacle, standard switch, and junction box

- Communicate how to test for grounding
- Install a 3-way switch
- Communicate how to test receptacles and wall switches
- Determine how communities are supplied with water
- Identify what problems might occur when plumbing systems are poorly installed
- Become familiar with common code requirements
- Explore the advantages and disadvantages of using different types of pipes in plumbing systems
- Identify pipe fittings
- Determine why valves are used in plumbing systems and identify different types and their specific uses
- Install a drain, vent, and faucet assembly

Instructional Materials:

Electrical Wiring text   *Basic Plumbing Skills* text
Home Improvement J-2-3 software   Compton's I*nteractive Encyclopedia* CD
Applied Technologies Electrical Wiring Trainer   Applied Technologies Plumbing Trainer
Applied Technologies Electrical and Plumbing Module Student Guide

Activities:

- Draw the fire triangle
- Install an electrical grounding rod
- Install wiring and a 15-amp circuit breaker
- Connect a 240-volt dryer outlet
- Install a receptacle, standard switch, and junction box
- Install a 3-way switch
- Install a drain, vent, and faucet assembly

Unit 12   Electronics Technology

   The Electronics Module is produced by the NIDA Corporation and has been adapted as a 15-activity, self-paced module that can be completed by either one or two students. The module involves the study of safety and electronic concepts developing a basic understanding of DC, AC, meters and measurements, resistance and ohm's law as well as basic circuit theory. The Computer-aided Instruction is augmented with a computer controlled test module where students see the theory in action and interact with the lesson materials.

Content Outline:

- Introduction To Computer-Aided Instruction (CAI)
- Safety Practices
- Introduction To Electronics Technology
- Direct Current Electricity
- Alternating Current Electricity
- Analog Electronics
- Digital Electronics
- Magnetism, Relays And Meters
- Introduction To Multimeters
- Introduction To The Oscilloscope
- Ohm's Law And Power
- Series Circuits
- Parallel Circuits
- Series-Parallel Circuits
- Inductor Operation
- Capacitor Operation
- Digital Circuit Construction

Objectives:
At the completion of this course, students will be able to:
- Learn how the mouse is used in a CAI lesson
- Learn how the keyboard is used in a CAI lesson
- Become familiar with lesson structure
- Understand the nature and effects of electric shock
- Recall practices for preventing electrical hazards
- Apply safe practices for working on energized circuits
- Define the terms electricity and electronics.
- Identify how electronics affects your daily life.
- State the four groups that comprise the subject of electronics.
- Define the term Direct Current (DC)
- Identify how direct current affects a circuit
- Identify applications that might use DC current
- Define the term Alternating Current (AC)
- Identify how alternating current affects a circuit
- Identify appliances that use AC current
- Define the term Analog
- Identify how analog affects a circuit
- Identify applications that use analog components
- Define the term Digital Electronics
- Identify how digital components affect a circuit
- Identify appliances that might use digital components

- Define magnetism
- Identify characteristics of magnets
- Define laws of magnetic attraction and repulsion
- Describe properties of magnetic lines of force
- Identify non-magnetic materials
- Define electromagnetism
- Identify the characteristics of electromagnet
- Describe the operation of a relay
- Describe the operation of a magnetic breaker
- Describe the operation of a meter
- Identify the quantities measured by multimeters
- Identify the two multimeter displays
- Describe the five functional sections of a multimeter
- Describe the purpose of each functional section
- Read a digital meter display
- Compare meter readings to voltages selected
- Operate a Digital Multimeter
- Describe how to set up a multimeter to measure voltage
- Describe how to read a multimeter's display when measuring voltage
- Describe the correct way to connect a multimeter to a circuit for measuring voltage
- Perform voltage measurements using a digital multimeter
- Describe how to set-up a multimeter to current
- Describe how to read a multimeter's display when measuring current
- Describe the correct way to connect a multimeter to a circuit for measuring current
- Identify the precautions to observe when making current measurements
- Perform current measurements
- Describe how to set up a multimeter to measure resistance
- Describe how to read a multimeter's display when measuring resistance
- Describe the correct way to connect a multimeter to a circuit for measuring resistance
- Describe the precautions to observe when making resistance measurements
- Describe the purpose of an oscilloscope
- Identify the quantities measured by an oscilloscope
- Describe single trace and dual trace oscilloscopes
- Identify the four major functional sections
- Describe the purpose of each control and switch
- Learn what Ohm's law is and how voltage current, and resistance are related
- Learn what power is and how voltage, current, and Ohm's law are related to power
- Prove the Ohm's law relationship of voltage, current, and resistance
- Identify a series circuit
- Calculate total resistance in a series circuit
- Calculate current in a series circuit
- Calculate voltage drops across resistance
- Recognize that the applied voltage is the same across each branch
- Calculate current in each branch of a parallel circuit
- Calculate total current from the sum of the individual branches of a parallel circuit
- Calculate total resistance in a parallel circuit
- Identify a series-parallel circuit
- Calculate total resistance in a series circuit
- Calculate current in a series-parallel circuit
- Calculate voltage drops in a series circuit
- Identify types of Inductors

- Describe the current opposing characteristic of an inductor
- Identify the unit of measure for inductance
- Identify characteristics of inductance
- Identify mutual inductance
- Examine common operations of an inductor
- Identify types of capacitors
- Identify the schematic symbol for a capacitor
- Identify characteristics of capacitance
- Identify the unit of measurement for capacitance

Instructional Materials:

NIDA Electronics Trainer
NIDA Electronics experiment cards
Applied Technologies Electronics Module

Activities:

- Use hand and power tool precautions
- Perform resistance measurements
- Set up an oscilloscope for normal operation
- Use an oscilloscope to analyze a waveform
- Measure voltage using an oscilloscope
- Measure current values in a series circuit
- Measure voltage drops in a series circuit
- Identify a parallel circuit
- Measure the applied voltage across each branch in a parallel circuit
- Measure current across each branch in a parallel circuit
- Measure total resistance in a parallel circuit
- Measure resistance values in a series circuit
- Measure current values in series-parallel circuit
- Measure voltage drops in a series-parallel circuit
- Examine characteristics of an inductor
- Describe charge and discharge of a capacitor
- Examine the circuit characteristics of a capacitor
- Construct a digital circuit
- Verify digital circuit operation