This handbook contains a competency-based curriculum for teaching industrial education in Alaska. Competencies are listed for the following areas: employability, auto maintenance, building maintenance, commercial fishing, communications, construction, drafting, electronics, energy and power, forestry and logging, graphics, high technology, horticulture, manufacturing, metals, mining and petroleum, small engine maintenance, technological impacts, transportation, wiring and plumbing, and woodworking. The handbook is organized in seven sections. Section 1 presents an introduction to competency-based curriculum, while Section 2 provides assistance in the program development of industrial education course content. Section 3, the core of the curriculum, provides the competencies and tasks for industrial education. Section 4 contains course descriptions to assist school districts in developing their vocational programs. Section 5 contains the curriculum analysis matrix to be used in determining competencies to be included in specific industrial education courses. Section 6 contains a sample skills card to be used in evaluating competency completion by students. Section 7 lists information on resources and materials available in Alaska and throughout the country. (KC)
INDUSTRIAL EDUCATION CURRICULUM

Bill Sheffield, Governor

Developed by the...

ALASKA DEPARTMENT OF EDUCATION
Adult and Vocational Education

Marshall L. Lind, Commissioner

Gerald D. Hiley, Director for Vocational Education

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Industrial education deals with industry. Historically, the class often favors some segments of industry over others. The class should not ignore particularities of a locale. Students in a maritime community may spend the entire year studying fishing. Industrial education in Alaska is designed to assist schools in targeting the local and state industries rather than traditional industrial arts which is geared more to manufacturing.

Alaska's economy is more diversified than apparent. The oil and gas industry has had a major impact on economic development and employment in the State and will continue to play an important role in Alaska's future. Fishing, mining, manufacturing--fish processing and timber are also major industries in Alaska. Secondary industries such as transportation, communication and utilities have been and will continue to lead growth in employment. This is due to the trend for more locally provided goods and services than were once provided by firms out-of-state (Alaska Planning Information, Alaska Department of Labor, February 1986).

This industrial education curriculum looks to industries relevant to Alaska. From the more traditional shop class (woods) to the nontraditional (transportation) to the very relevant (mining and petroleum), this handbook seeks to direct industrial education to prepare students for jobs in Alaska, as well as introduce students to new technologies. Just as industry is hardly static and unchanging, this curriculum requires constant updating and revision. The curricula should be a foundation for further study in these disciplines.

This handbook is a competency-based curriculum. During two audioconferences, educators from around the state provided input for completing the draft. A task force of three educators convened to complete the handbook. The competencies and identified units basically came from those utilized in other states with the addition of those deemed integral to industry in Alaska: forestry, logging, mining and petroleum. While horticulture and agronomy are not booming industries in Alaska, gardening and truck farming, as well as the Delta barley project and the "famed" Matanuska Valley, point to viable, valuable contributions from those fields. The horticulture unit concentrates on greenhouse.

The handbook is organized in seven sections:

Section I presents an introduction to competency-based curriculum. The role of vocational instructors in curriculum planning, implementation and evaluation is also included.

Section II provides assistance in the program development of industrial education course content.

Section III is the core of the curriculum, it provides the competencies and tasks for industrial education.

Section IV contains course descriptions to assist school districts in developing their vocational programs.
Section V contains the curriculum analysis matrix to be used in determining competencies to be included in specific industrial education courses.

Section VI contains a sample skills card to be used in evaluating competency completion by students.

Section VII lists information on resources and specific materials available from a variety of sources in Alaska and throughout the country.

It is recommended that all students participate in career awareness and exploration experiences to help them understand the connection between school and work and make career plans.
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Introduction to Competency-Based Curriculum
Competency-Based Curriculum

Vocational education should be directed toward the skills, knowledge, and attitudes needed for successful employment. Changes in technology are affecting the job requirements in industrial education. Such changes require industrial educators to continually update their curriculum in order to prepare students for competition in the job market.

An effective method for delivering vocational education is through a competency-based curriculum. This curriculum is based on a task analysis of the key occupations in industrial education. Once a competency-based curriculum is set in place, student performance must be measured on levels of proficiency in those competencies. Thus, the critical features of competency-based education are:

1) validating competencies to be included in the curriculum; and
2) evaluation of student competency levels.

This curriculum handbook sets direction for local curriculum developers. It provides a framework for developing courses of study and lesson plans in local schools.

Curriculum Based On Competencies

Competence refers to the adequate performance of a task. The task may be evaluated according to the performance or process, the product, or both.

Competency-Based Vocational Education consists of programs that derive their content from the tasks performed in each occupation/job and assess student performance on the basis of preset performance standards.

Learning materials define the competencies the student is to learn, the criteria by which the student will be evaluated, and the conditions under which the evaluation will occur.

Competency-based instruction places emphasis on the ability to do, as well as on learning how and why. Student performance and knowledge are individually evaluated against the stated criteria, rather than against group norms.

The competency process utilizes a checklist of attitudes, knowledge and skills that are commonly needed by entry level employees in industrial education occupations. In developing this curriculum handbook, a cross-section of professionals were asked to respond to the checklist on the basis of needs within their own establishments. The checklists were tallied and summarized to determine which attitudes, knowledge and skills were common to firms in Alaska. Also, the competencies in each area were ranked as to decreasing importance.
Student Performance Assessment

A curriculum becomes competency-based when students are assessed on the basis of their competence. Sample skill cards are provided in this guide for teachers who wish to use them in assessing the competency levels of their students. The card has four levels of proficiency which allow continued development of skills. The card can be used to monitor students' progress as they move between industrial education classes, between teachers and grade levels and between school and work. The completed skills card is an important part of a placement portfolio when students begin their job searches.

Curriculum Delivery Systems

Vocational Student Leadership Organizations

Some of the competencies in this curriculum guide cannot be fully met in traditional classroom and lab settings. The Vocational Industrial Clubs of America (VICA) is a delivery system which can be integrated into the regular school program. Human relations skills as well as job skills will be enhanced by student participation in VICA. VICA activities should complement instruction in the industrial education classroom and lab. They should be integrated as a curriculum delivery system and not allowed to become an extracurricular activity.

Cooperative Work Experience

Some of the competencies identified in this guide cannot be fully developed at a school site. A work station in the community offers realistic experiences in fulfilling the program goals in career development and human relations. Cooperative Work Experience offers an excellent vehicle for the delivery of instruction. With well developed training plans, teachers and employers can cooperate to prepare students for employment. Cooperative Work Experience extends the instructional program beyond the availability of equipment and instructor time at the local school. Teachers and employers must maintain regular communications to assure that students are receiving a high quality experience.

The Rural Student Vocational Program (RSVP) provides a two week fulltime work experience for students from rural areas where job stations are limited or non-existent.

The Job Training Partnership Act (JTPA) provides on-the-job experience to disadvantaged youth in both urban and rural areas.
The vocational instructor fulfills many roles which include the following responsibilities:

- Prepares a written vocational program plan.
- Develops and maintains a written program philosophy with objectives that support the philosophy.
- Maintains a written list of competencies identified as needed for the program area.
- Designs and maintains a classroom management system for implementing the curriculum materials provided for the program area.
- Evaluates the curriculum content periodically to determine curriculum changes and update. This includes the involvement of the students (present and former), advisory committee members, and other personnel.
- Blocks units of instruction and plans lesson plans based on the competencies of the occupation.
- Provides appropriate instructional materials, supplies, and equipment for the students to use.
- Reviews the instructional materials to assure that they are free from sex bias and sex role stereotyping.
- Works with an advisory committee.
- Assists and/or serves as an advisor to the appropriate student organization related to the vocational program area.
- Plans and arranges an appropriate classroom learning environment. This involves assisting students of different abilities to work at their own pace and in cases where remedial instruction is needed, securing additional help for those students.
- Reinforces basic skills of reading, communication (written & oral) and computation through vocational education experiences.
- Helps determine what objective(s) should be established for handicapped students as a part of the individual educational plan (IEP) development.
- Uses a grading procedure that is made available to all students at the beginning of their training.
- Sets an example for grooming and dress that is generally found in the occupational area in business or industry to enable students to establish appropriate standards.
Benefits of the Competency-Based Curriculum

Competency-based vocational education offers several benefits to students:

1. The competencies/tasks are directed to the student and provide measurable criteria for determining when the student has acquired the necessary knowledge and skills.

2. Students receive realistic training for the job. They become competent in tasks that are relevant to the occupation.

3. Students know what is expected of them throughout the course. The competencies are made available to them at the onset. They know what they will be doing and how well it must be done.

4. Each student is individually responsible for completing each competency attempted in the curriculum.

5. Students are not compared with other students in their accomplishments because each is expected to work according to his/her individual capabilities and learning style. Because of the various evaluation policies of different school systems, the ideal of not comparing students in determining grades is not always possible. However, the basic thrust of the competency-based program is to evaluate each student according to his/her accomplishment of each task as he/she works up to individual capability.
Program Development

The format of this handbook was selected to aid administrators and teachers in concentrating on the skills needed for vocational training. It will assist in selecting the array of units and the delivery system which fit the school. This provides the flexibility of varying the course content to include the most valuable skills as appropriate for the scope and sequence. The primary importance is that students are able to secure the foundation skills. Schools can vary their delivery systems to maximize student opportunities by:

1. Offering courses on alternate years or other planned sequences
2. Offering two or more courses in the same class
3. Providing individualized materials and instruction

A matrix is included in this guide for use in planning the courses to be offered and the content of each course.
Competencies and Tasks
Employability Skills

Competency: Identify career choices

Tasks: Conduct a self-assessment:

a. Assess values in relation to work
b. Recognize skills and aptitudes
c. Assess employment history and experience
d. Describe obstacles to employment
e. Use Alaska Career Information System and other career counseling systems and publications

Identify career clusters:

a. Know specific jobs within clusters and duties
b. Describe apprenticeship/training programs

Explain the use of labor market information:

a. Describe the current local labor market
b. Identify growth/demand occupations
c. Relate career choices to local labor market

Select a career goal:

a. Know how skills could be used in other jobs
b. Plan for career goal
c. Develop specific steps to reach goal

Competency: Identify jobs using industrial education skill training

Tasks: Describe jobs in:

a. Auto Maintenance
b. Building Maintenance
c. Commercial Fishing
d. Communications
e. Construction
f. Drafting
g. Electronics
h. Energy and Power
i. Forestry and Logging
j. Graphics
k. High Technology
l. Horticulture and Gardening
m. Manufacturing
n. Metals
o. Mining and Petroleum
p. Small Engine Maintenance
q. Technological Impacts
r. Transportation
s. Wiring and Plumbing
t. Woodworking

Competency: Identify employment opportunities

Tasks: Identify requirements for job

Investigate educational and occupational opportunities
Locate resources for finding employment
Confer with prospective employers

Competency: Prepare a resume and job application

Tasks: Obtain a social security number

List:

a. past and present work experience
b. hobbies and interests
c. community activities or memberships
d. in-school activities or memberships
e. awards, positions or club offices
f. adult references, including addresses and phone numbers

Competency: Write a cover letter

Tasks: Explain when and how to write a cover letter

Explain what a writing sample tells a potential employer
List the things the cover letter must say

Competency: Prepare for an interview

Tasks: Explain how to contact an employer to schedule an interview
Describe questions and responses asked in an interview
Explain proper etiquette for an interview
Describe how to dress for an interview
Discuss how to end an interview
Competency: Follow up the interview

Tasks: Analyze the interview

Determine whether a follow-up letter or call is required

Explain how to write a thank-you note or make a follow-up call

Competency: Dress appropriately on the job

Tasks: Describe proper dress for jobs in:

- Auto Maintenance
- Building Maintenance
- Commercial Fishing
- Communications
- Construction
- Drafting
- Electronics
- Energy and Power
- Forestry and Logging
- Graphics
- High Technology
- Horticulture and Gardening
- Manufacturing
- Metals
- Mining and Petroleum
- Small Engine Maintenance
- Technological Impacts
- Transportation
- Wiring and Plumbing
- Woodworking

Discuss the importance of being neat and clean

Competency: Prevent work-related injuries

Tasks: Describe the importance of safe working attitudes

Describe first-aid and CPR

Discuss the importance of wearing protective gear including:
- hardhats, eye and ear protection, respirators, gloves, chaps, safety lines, boots, personal flotation devices and survival suits

Describe safety procedures for:

- chemicals and explosives
- flammables
- electricity
- sodtering and weeding
- heavy equipment
- hand and power tools
- ladders and scaffolds
- construction materials
Discuss special safety considerations relevant to each industrial education area

Competency: Be reliable and dependable
Tasks: Maintain acceptable attendance records
   Explain importance of being on time
   Give timely notice of interruptions to work schedule
   Demonstrate reliability
   Follow rules of work site or training site

Competency: Maintain good personal relations
Tasks: Use positive attitudes with others
   Accept supervision and criticism
   Cooperate with others
   Accept the chain of command

Competency: Be honest
Tasks: Define honesty and integrity
   Explain how to deal with theft and dishonesty
   Relate employee integrity to overall company performance

Competency: Demonstrate initiative and productivity
Tasks: Explain importance of:
   a. Organizing time effectively
   b. Being responsible
   c. Caring about the quality of work
   Discuss the value of constructive suggestions
Competency: Be assertive

Tasks: Differentiate between assertive, aggressive and passive behavior

Discuss whom to go to for employee problems

Competency: Demonstrate work maturity

Tasks: Describe importance of openness to new situations on the job

Discuss the characteristics of the mature person:
   a. Self-acceptance
   b. Consideration and respect for others
   c. Self-control
   d. Positive thinking and attitudes
   e. Flexibility

Describe the importance of being flexible

Name ways to develop and maintain good work relationships

Explain the difference between personal and job-related problems

Describe the importance of orderly and systematic work behavior

Competency: Identify personal responsibilities related to employment

Tasks: Secure adequate transportation

List adequate child care alternatives

Inventory independent living skills

Develop personal finance plan

Discuss employer's expectations regarding substance abuse

Competency: Maintain good health for effective job performance

Tasks: Explain the relationship between regular exercise, adequate rest, nutrition and job performance

Discuss the issue of smoking on the job

Discuss drug abuse as it relates to job performance
Competency: Identify employee rights and responsibilities

Tasks: Discuss state labor laws relating to compensation

- Explain the use of tax forms
- Explain the minimum wage and types of exempt businesses
- Explain employee benefits, rights and responsibilities
- Explain labor contracts, grievance procedures and the role of unions
- Discuss employee benefits, rights and responsibilities
- Explain labor contracts, grievance procedures and the role of unions
- Discuss a sample company personnel policy

Competency: Follow OSHA guidelines

Tasks: Explain the purpose of the Occupational Safety and Health Act

- Describe your rights under workers-right-to-know and other portions of the Act
- Discuss how to resolve hazardous and OSHA violation situations

Competency: Follow verbal and written directions

Tasks: Follow directions

- Ask for clarification
- Use listening skills
- Review situations of poor communications
- Explain the importance of reading directions when assembling and repairing equipment

Competency: Apply reading and writing skills

Tasks: Describe how to find information in trade and consumer magazines and journals

- Describe how to write memos, lists, and reports
- Demonstrate how to complete forms accurately
- Locate and correct errors in spelling, grammar and punctuation
- Describe how to use supply catalogs to identify and order materials
Competency: Use effective leadership skills

Tasks: Describe the Vocational Industrial Clubs of America (VICA) and how it teaches leadership skills:

a. Participate in meetings according to rules of parliamentary procedure
b. Function effectively on committees by accepting assigned responsibilities
c. Plan and conduct effective group leadership activities
d. Participate in society in a democratic way
e. Be punctual and dependable
f. Follow rules, standards and policies
g. Work cooperatively with others

Identify leadership characteristics and responsibilities
Demonstrate membership characteristics and responsibilities
Evaluate career options and employment opportunities

Competency: Solve problems

Tasks: Explain the importance of having a method for analyzing and solving problems

Identify problems
Obtain information
Analyze problems
Develop and analyze alternative solutions
Choose a course of action
Persevere through hardships
Recognize and change unworkable solutions

Competency: Identify proper termination procedures

Tasks: Describe how to:

a. Write a letter of termination
b. Conduct an exit interview
c. Write a letter of recommendation
d. Request for advance notice
e. Make final settlements (in regards to retirement, physical injury, social security, severance pay, etc.)
Auto Maintenance

(A) Indicates Advanced Task or Competency

Competency: Understand automotive history
Tasks: Describe the historical development of the automobile
Describe the development of gasoline and diesel engines

Competency: Identify internal combustion engine terms, principles, and technology
Tasks: Explain terms and principles associated with various internal combustion engines
Compare the workings of gasoline and diesel powered automobiles
Explain the operation of turbine and Wankel engines
Describe various types of engines, such as in-line and v-type engines

Competency: Work safely
Tasks: Describe the components of safe automotive working environments
Identify appropriate clothing
Explain personal safety devices such as gloves, safety glasses, and steel-toed boots
Explain proper use of automotive hand and power tools
Describe hazards of using the wrong tools and parts
Describe handling and storage procedures for gasoline and other flammable and hazardous materials
Explain shop equipment procedures for equipment such as hydraulic jacks, impact air tools, grinders, and steam cleaners
Explain procedures for running engines in closed spaces
Explain safe blocking and jacking procedures

Competency: Understand the value of systematic diagnosis
Tasks: Explain the value of methodical diagnosis
Explain systematic approaches to automotive diagnostics
Discuss the troubleshooting significance of relationships between various automotive systems, such as braking, steering, and suspension systems; and fuel, electrical, and transmission systems.

Explain diagnostic equipment terms, principles, and use.

Competency: Maintain automotive cooling systems

Tasks: Explain cooling systems terms, principles, and components and their functions.
Contrast air and water-cooled engines.
Explain the function of thermostats, fan belts, pressure caps, and radiators.
Explain cooling system diagnosis/repair terms, principles, and techniques.

Competency: Maintain automotive fuel systems

Tasks: Explain fuel systems terms, principles, and components and their functions.
Explain carburetors and floats, fuel pumps, chokes, and injectors.
Explain fuel systems diagnosis/repair terms, principles, and techniques.

Competency: Maintain automotive electrical systems

Tasks: Explain electrical systems terms, principles, and components and their functions.
Differentiate between ignition, cranking, charging, instrumentation, and lighting systems.
Discuss the function, operation, and safe charging of batteries.
Explain electrical systems diagnosis/repair terms, principles, and techniques.

Competency: Maintain automotive lubrication systems

Tasks: Explain engine lubrication systems terms, principles, and components and their function.
Explain lubrication system diagnosis/repair terms, principles, and methods.
Competency: Maintain automotive pollution control systems

Tasks: Explain pollution control systems, terms, principles, and components and their functions

- Compare various muffler, exhaust pipe, pollution control valve (PCV), and catalytic converter systems
- Explain pollution control diagnosis/repair terms, principles, and techniques

Competency: Maintain automotive braking systems

Tasks: Explain braking system terms, principles, and components and their functions

- Compare the construction, operation, and servicing of drum and disk brakes
- Explain braking systems diagnosis/repair terms and techniques

Competency: Maintain automotive steering systems

Tasks: Explain steering systems, terms, principles, and components and their functions

- Compare manual and power steering systems
- Explain alignments and wheel balance
- Explain steering systems diagnosis/repair terms, principles, and techniques
- Inspect and change tires

Competency: Maintain automotive suspension systems

Tasks: Explain suspension systems terms, principles, and components and their functions

- Compare various shock absorber and spring systems
- Explain suspension systems diagnosis/repair terms and techniques

Competency: Maintain automotive chassis systems

Tasks: Explain chassis systems terms, principles, and components and their functions

- Explain how to locate and service chassis lubrication points
- Explain chassis systems diagnosis/repair terms, principles, and techniques
Competency: Maintain automotive transmission systems

Tasks: Explain transmission terms, principles, and components and their function

Compare manual and automatic transmissions

Explain transmission systems diagnosis/repair terms, principles, and techniques

(A) Replace a universal joint

(A) Overhaul manual and automatic transmissions

Competency: Maintain automotive heating and air conditioning systems

Tasks: Explain heating and air conditioning systems terms, principles, and components and their functions

Explain the significance of the source of energy for these systems

Explain heating and air conditioning systems diagnosis/repair terms, principles, and techniques

Competency: Maintain automotive hydraulic systems

Tasks: Explain hydraulic systems terms, principles, and components and their functions

Explain hydraulic systems diagnosis/repair terms, principles, and techniques

Competency: Perform routine automotive maintenance and tune-ups

Tasks: Demonstrate how to check and adjust fluid levels: radiator, master cylinder, battery, engine oil, transmission, and rear end

Check and adjust tire pressure

Change:

a. engine oil and filter
b. air filter
c. spark plugs and points
d. dwell and timing
e. light bulbs and wiper blades
f. fuel filter

Adjust fan belt tension

Clean battery terminals
Lubricate moving parts such as: door hinges, hood hinges, windows, chassis

Review the owner's manual of the latest model of an automobile to determine unique maintenance requirements

(A) Conduct automotive inspection

(A) Use automotive diagnostic equipment

Competency: Winterize automotive systems

Tasks: Explain how extreme temperatures impact automotive systems

Determine local temperature and humidity parameters and other climatic considerations

Describe winterization procedures for each of the above automotive systems

Discuss the significance and proper installation and/or use of:

a. snow tires and chains
b. engine block heaters
c. anti-freeze and radiator heaters
d. winter-weight oil and lubricants
e. thermostats
f. battery insulation/heaters
g. special windshield wash solutions
h. graphite door lock lubricant
i. aerosol starting compounds
j. fuel additives (Heet)

Follow manufacturers' recommendations

Discuss special considerations for working on/with cold vehicles and metals

Discuss winter carbon monoxide (CO) hazards and poisoning prevention techniques

Avoid operating vehicles in extreme conditions

Assemble survival gear for winter vehicle operation
Competency: (A) Map automotive systems

Tasks: Explain how to map the following automotive systems:

a. electrical  
b. cooling  
c. fuel  
d. lubrication  
e. pollution control  
f. braking  
g. steering  
h. suspension  
i. chassis  
j. transmission  
k. hydraulic  
l. heating and air conditioning

Competency: (A) Apply automotive maintenance skills

Tasks: Discuss the steps in examining and selecting a used automobile

Compare ways for reducing the cost of automotive repairs such as use of used parts

Troubleshoot non-automotive vehicles such as marine engines, motorcycles and ATV's
Building Maintenance

(A) Indicates Advanced Task or Competency

Competency: Maintain building floors

Tasks: Select and use proper floor maintenance chemicals
- Handle and store chemicals safely
- Remove dirt and grease from resilient or hardwood floors
- Seal, wax and buff a resilient and hardwood floor
- Strip or light scrub a floor using an automatic floor machine
- Sweep and mop stairs

Competency: Use and maintain cleaning equipment

Tasks: Explain how to:
- a. Operate and maintain wet and dry vacuums
- b. Treat a dust mop
- c. Use a mop and bucket
- d. Operate a floor machine

Competency: Clean walls and windows

Tasks: Explain how to safely use ammonia, TSP, or disinfectant describing appropriate usage for such chemicals
- Wash and spot-clean walls and windows
- Break in a new chalkboard

Competency: Clean carpet

Tasks: Select cleaning fluids and safely handle and use for given task
- Shampoo a carpet using the dry-foam method and a rotary machine
- Vacuum
- Spot-clean stains and gum from carpets
Competency: Maintain light fixtures

Tasks: Select cleaning fluid and safely handle and use for given task
Replace balast and starters in fluorescent fixtures
Wash fluorescent fixtures
Replace burned-out or faulty fluorescent lamps and incandescent bulbs

Competency: Fix basic electrical problems

Tasks: Identify safety procedures for working with electricity and electrical devices
Identify and use common electrical tools including:

a. Pliers
b. Electrical pliers
c. Screwdrivers
d. Neon testers
e. "Fish" tape
f. Voltmeters
g. Ammeters (in line and clamp on)
h. Volt-Ohm-Meters
i. Electric hand drills
j. Bit and brace
k. Strippers
l. Needle-nosed pliers
m. Side cutters
n. Stud locators

Explain basic electrical theory and ohms law
Explain basic designs of building electrical circuits
Identify, troubleshoot, and repair common electrical fixtures including:

a. Service panels
b. Meter boxes
c. Breakers
d. Fuse boxes
e. GFI controls
f. Switches
g. Main panels
h. Sub-panels
i. Conduits
j. Junction boxes
k. 220 outlets
l. 110 outlets
(A) Troubleshoot and repair electrical control and communication systems including:
   a. temperature control systems
   b. electric alarm and monitoring systems
   c. communications systems

Competency: Repair and paint damaged walls
Tasks: Replace broken window glass
       Repair nail holes
       Read blueprints
       Locate wall studs
       Patch damaged walls
       Replace, tape and paint drywall
       Identify types and kinds of paints
       Use brushes and rollers
       Paint interior and exterior walls

Competency: Clean and polish surfaces
Tasks: Explain the different types of polishes and their applications
       Select and use appropriate cleaning fluid
       Clean and polish metals such as aluminum/stainless steel/copper
       Clean and dust window sills and desks

Competency: Maintain basic plumbing
Tasks: Explain plumbing terms and principles
       Use a tube cutter on copper tubing
       Repair dripping faucets
       Clear clogged drains and traps
       Cut plastic pipe with saw
       Use a flaring tool to make a flare on the end of a copper tube
Solvent-weld plastic pipe joints
Make a sweated joint on a copper tube
Use a pipe vice
Sweat-fit a copper "T" into an existing line
Thread pipe by hand
Operate a propane torch
(A) Cut, taper, and thread a length of pipe using a power threading machine
(A) Use a power tool to cut pipe
(A) Cut the proper threads on ends of galvanized pipe using a power threading machine and tapering pin

Competency: Service heating and other building support equipment

Tasks: Distinguish between types of heating systems
Troubleshoot heating system problems
Order heating system parts and supplies
Check and service an air compressor
Determine water level in a boiler
Change the heating plant air filter
Check oil level in oil tank
Check propane level in propane tank
Check propane fixtures for leaks
(A) Evaluate the heating system in terms of building insulation, air supply, and energy conservation

Competency: Secure building and property

Tasks: Install/repair a chain link fence
Install various door lock devices
Secure all locks
Brace windows and doors when appropriate
Test and repair security system
Competency: Safely store materials and chemicals

Tasks:
- Label shelves for storage of material
  - Store flammables in proper place
  - Properly label all chemicals
  - Store hazardous substances out of the reach of children
  - Wear appropriate clothing and protective devices while working with hazardous substances

Competency: Perform outdoor building maintenance

Tasks:
- Select chemicals for ice removal
  - Remove snow and ice
  - Use plows and blowers safely
  - Repair exterior siding, gutters, shutters, etc.
  - Repair sidewalk, steps and stairs
  - (A) Load and unload material with a forklift

Competency: Care for lawn and shrubbery

Tasks:
- Plant and maintain shrubbery
  - Prepare soil and plant and maintain lawn
  - Mow a lawn using a power-operated hand mower
  - Select and spread fertilizer on a lawn
  - Operate and maintain mechanical spreaders and mowers
  - Discuss the safe use of herbicides
  - Run a lawn edger
  - Plant and maintain flower beds
  - (A) Identify all control devices, their locations, and the safety rules related to the operation of a tractor
  - (A) Operate a tractor with mower attachment
Competency: Dispose of trash

Tasks:
- Collect trash
- Transport trash properly
- Burn trash properly (if applicable), removing aerosol cans, batteries, and other items which might explode
- Dispose toxic materials properly

Competency: Maintain rest rooms

Tasks:
- Select and use proper cleaning fluid
- Wet mop with disinfectant
- Fill dispensers
- Clean and sanitize sinks, mirrors, toilets, urinals, walls and partitions
Commercial Fishing

(A) Indicates Advanced Task or Competency

Competency: Identify the harvesting and processing of marine products

Tasks: Identify lifecycles and habitats of commercial marine species

Explain harvesting methods for common non-vertebrate and vertebrate marine species

Explain processing methods for marine products

Explain importance of following state and federal fishing regulations

Discuss the economics of and procedures for setting up fish hatcheries

Discuss the economic and biological impacts of manipulating gene pools and artificial rearing

Identify edible seaweeds

Explain how seaweeds are harvested, preserved and processed

Competency: Correctly handle, process and market marine products

Tasks: Explain proper ways to handle fish and shell fish

Explain the importance of vessel and product sanitation

Explain proper methods of storing fish products including icing and refrigeration

Explain methods of cleaning seafood

Describe both shore-based and floating processing operations

Describe and practice quality control in processing

Keep seafood cool, clean, moist and moving

Explain canning and freezing processes

(A) Trace marine products from the ocean to the retailer

(A) Explain economics of commercial fishing

(A) Explain marketing considerations
Competency: Use good boating safety and seamanship

Tasks: Explain the basic terms and principles of seamanship

   Explain basic knot techniques

   Describe boating laws

   Explain navigational aids and charts

   Explain how to use nautical equipment such as compasses, sextants, dividers, radar, fathometers, sonar, loran, barometers, and CB and marine radios

   Recognize changes in weather conditions

Competency: (A) Get a vessel underway

Tasks: Develop and follow a check list for getting underway

   Engage bilge and engine room blowers and bilge pumps

   Maintain proper level of coolant in expansion tank

   Determine if all navigation lights are functioning

   Tighten engine mounts

   Inspect fire-fighting equipment for wear, location, and type

   Secure deck equipment, lashings, hausers, or mooring lines

   Inspect personal flotation devices for number, fit, integrity, and location

   Inspect survival suits for number, fit, integrity, location and type

   Inspect vessel for fuel leakage

   Prepare list of equipment to be checked for oil leakage

   Secure watertight doors, hatches, vents, and skylights

   Bleed air compressor of water

   Check and maintain batteries

   Determine fuel levels

   Inspect water level indicators for cleanliness

   Test radio equipment
Inspect antennas
Determine if hydraulic steering equipment is free of air and water
Determine that rudder stuffing box is functioning properly
Tighten propeller stuffing box
Determine if proper voltage is being generated
File a float plan

Competency: (A) Maneuver a vessel

Tasks: Obtain a current weather forecast
Observe the rules of the road
Follow safe boating practices
Use navigational aids, tide and current charts and equipment
Maintain adequate safety margins in regards to weather and sea conditions

Competency: (A) Conduct deckhand duties

Tasks: Hand or hoist equipment and supplies aboard
Work riggings such as nets, slings, hooks, cables, booms, and hoists
Stand lookout, steering, and engine room watches
Operate dories, dinghies, and skiffs
Attach accessories, such as floats, weights, and markers to nets and lines
Pull and guide nets and lines onto vessel
Wash deck, conveyors, knives, and other equipment, using brush, detergent, and water
Lubricate, adjust, and maintain engines and equipment

Competency: (A) Anchor a vessel

Tasks: Maneuver vessel to anchorage
Anchor vessel by using anchor winch or windlass
Retrieve and secure anchor and stack (tier) anchor chain in locker
Competency: (A) Dock a vessel
Tasks: Assign tasks and stations for vessel mooring
  Maneuver to dock
  Secure mooring lines to dock and/or other vessels
  Secure engine room and secure propeller shaft
  Release towing gear

Competency: (A) Conduct line fishing duties
Tasks: Define line fishing terms
  Explain principles and techniques associated with various line fisheries
  Lay out gear
  Cast line into water and hold, anchor, or troll
  Retrieve gear onto boat deck by hand, reel, or winch
  Remove, clean, pack and store catch appropriately
  Slit fish, remove viscera, wash cavity and prepare for storage

Competency: (A) Perform pot and trawl fisher duties
Tasks: Define pot fishing terms
  Explain pot fishing techniques
  Rig boat and deploy gear such as pots, floats and markers
  Tie marker float to line, attach line to pot, fasten bait inside pot, and lower pot into water
  Retrieve gear and remove catch
  Hook marker float with pole and haul up pot
  Remove catch or dump catch on deck
  Measure catch with fixed gauge
  Place legal catch in container and return illegal catch to sea
If applicable, rig and lower dredge (rake scoop with bag net attached), drag dredge behind boat to gather marine life from water bottom, and hoist it to deck by hand using block and tackle.

Competency: (A) Conduct net fishing duties

Tasks:

Define terms associated with various net fisheries

Explain principles and techniques associated with various net fisheries

Locate quarry using equipment available

Operate and maintain net fishing equipment such as dip, diver, gill, hoop, lampara, pound, trap, reef, trawl, and travel nets

Operate and maintain seine equipment such as purse seine, haul, drag, or beach seine and power skiffs

Insert and attach hoops, rods, poles, ropes, floats, weights, beam runners, other boards, and cables to form, reinforce, position, set, tow, and anchor net as required

Attach appropriate flags and lights to buoys to mark and identify nets

Neel net with appropriate gear

Remove catch using appropriate techniques and equipment such as dip net, bail buckets, hydraulic pumps, conveyor, lifting net, blocks, tackles, and dumping catches

Clean, store and transfer catch appropriately

Competency: (A) Maintain vessels

Tasks:

Arrange for grid, dry docking, or haul-out

Change brushes in auxiliary engines

Change lube oil and fuel filters on auxiliary engines

Determine if motor bearings are excessively worn

Clean electric motor

Prepare list of hoses, valves, connections, gaskets, and tanks needing repairs

Determine if constant-voltage regulator is functioning properly

Determine if drive bolts on air compressors are excessively loose.
Tighten panel box fittings to prevent vibration
Clean keel cool strainers, oil coolers and oil strainers in marine gears
Drain water out of fuel traps
Tighten fuel and oil line connections on engines
Inspect day tanks containing fuel for leaks
Lubricate deck and engine room equipment on a regular schedule
Determine vessel's manning requirements
Splice eye into line
Wash down vessel's superstructure and decks
Inspect and maintain hull, keel, and rudder assembly

Competency: (A) Prepare meals aboard the vessel

Tasks:
- Plan menus
- Obtain and store food properly
- Prepare a balanced meal
- Clean galley deck, woodwork, cabinets, dishes, glasses, flatware, trays, pots and pans

Competency: (A) Perform vessel emergency procedures

Tasks: Explain emergency procedures for: fire, collisions, capsize, foundering, man-overboard and personal injuries:

a. Alert crew
b. Issue personal flotation and immersion protection devices
c. Administer first aid to prevent shock and control bleeding
d. Administer CPR
e. Launch and operate lifeboat and life raft
f. Close emergency fuel shutoff valves
g. Extinguish Class "C" fire
h. Act as lookout to keep person in sight who has been lost overboard
i. Secure engine room to prevent spread of fire
j. Send out distress signals
k. Sound abandon-ship alarm, if necessary
Competency: (A) Maintain and operate fish processing and preservation equipment

Tasks: Explain the maintenance and operating procedures for:

a. freezing equipment
b. canning equipment
c. ice-making equipment
d. auxiliary power generating equipment
e. seafood cleaning equipment
f. conveyor and product handling equipment
g. chilling and cooling equipment
h. testing and quality control equipment

Competency: (A) Maintain fish quality

Tasks: Define fish processing and refrigeration terms

Identify fish processing sanitation principles and procedures

Determine how long various marine products can be preserved by refrigeration

Explain upper and lower refrigeration temperature limits for the various marine products

a. Recognize potential sanitation problems
b. Explain disinfecting procedures
c. Plan stock rotation to insure freshness

Identify potential chemical, biological and bacteriological problems in the fishing industry

a. Conduct bacteria tests
b. Explain how to identify problems by sight and smell
c. Properly dispose of contaminated marine products
d. Explain how to anticipate and prevent sanitation problems before they occur
Competency: Identify the principles of light and sound transmission

Tasks:
- Describe the nature of light and sound
- Describe implications of satellite communications
- Describe how a communications satellite functions
- Explain the concept of orbit-stationary orbit
- Explain how a ham radio works
- Explain ways of transmitting microwaves
- Describe how radar, lasers and fiber optics works
  - Explain two ways signals are sent by light
  - Control a device using light rays
  - Transmit light through a fiber
  - Explain how fiber optics is used in telephone communications
  - Contrast the advantages and disadvantages of fiber optics in communication
  - Construct a project using fiber optics
  - List industries utilizing fiber optics

Competency: Understand how the telephone works

Tasks:
- Define the terms associated with telephones and telecommunications
- Explain the principles of telephones and their operations
- Describe the nature of sound
- Identify the inventor of the telephone
- Describe the principles of microphone operation
- Explain how the voice causes changes in electrical impulses in the phone
- Explain how the receiver converts the transmitted current to audio-frequency
Explain the function of the diaphragm in the sender and the receiver

Sketch a typical telephone circuit

Explain ways telephone electrical impulses are transmitted

Explain phone industry jobs

(A) Contrast information transmission by acoustical energy with that of other energy sources

Competency: Understand how the radio works

Tasks: Define the terms associated with radios and their operations
Explain the principles associated with radios and their operations
Explain the meaning of AM and FM radio dial numbers
Explain how sound is transmitted and received
Describe radio industry jobs
(A) Sketch a simple sender-receiver radio circuit
(A) Construct a simple crystal set receiver

Competency: Understand how a television functions

Tasks: Define terms associated with televisions and their operations
Explain the principles associated with televisions and their operations
Contrast television and radio
Explain the function of the television camera
Identify TV's impact on society
Explain what is meant by line of sight transmission
Explain TV-related jobs

Competency: Identify recent innovations in home communications

Tasks: Identify ways cable systems may communicate between homes
Explain how a video tape recorder can be used in home communications
Contrast a video disc player with a phonograph
Describe the communications potentials of home computers
(A) Name types of computer-generated audio

(A) Describe advances in acoustical information storage and retrieval

Competency: Identify uses of citizens band and amateur radios

Tasks: Define terms associated with citizens band and amateur radios
Contrast radio transmitters and receivers
Explain uses of CB Channels
Name basic requirements for ham operators
Identify regulations governing the use of CB and ham radios
Discuss the issue of privacy and censorship in communications
(A) Send voice and code messages by walkie-talkies

Competency: Identify computer communications methods and systems

Tasks: Differentiate among several types of computers
Explain computer terms and principles
Contrast methods of electronic storage
Explain magnetic tape use in printed communications
Explain facsimile machines and optical scanners
Discuss the impact of computers on communication
Explain ways computers "talk" to each other
Explain how a dot matrix printer produces a letter
List jobs in computer communications
Describe historical developments in electron generation
Contrast electronic input and output devices
Describe simple communication systems linking people to people, people to machines, machines to machines, and machines to people

(A) Discuss electrical theory, control, and transmission as they relate to electrical applications in telecommunications

(A) Discuss basic elements of electronic telecommunications such as: semi-conductors, integrated circuits, and computer circuits
(A) Describe basic principles of acoustical communication, electronic telecommunication, and computer information storage and retrieval systems

(A) Identify major developments in telecommunication technologies

(A) Describe the operation of major components used in various telecommunications systems

Competency: Analyze the effects of telecommunications on society

Tasks: Discuss the information revolution's impact on individuals and institutions

Discuss implications of the automated home

Predict future telecommunications systems

Describe jobs in the telecommunications field
Construction

**Competency:** Work safely

**Tasks:** Follow directions and procedures
- Dress appropriately
- Explain emergency shop procedures
- Explain first-aid procedures
- Demonstrate proper use of tools
- Follow job-site rules and government regulations

**Competency:** Use common construction tools and materials

**Tasks:** Explain the terms and principles associated with construction
- Explain the various types of building materials used in construction:
  - a. Identify plywood grades and explain their uses in residential construction
  - b. Identify lumber grades and sizes, their relative costs and common uses
  - c. Identify a variety of fasteners used in construction
  - d. Identify common flooring, walls, roofing, and insulation materials
- List commercial and non-commercial construction materials locally available
- Identify hand and power tools and their use and care
- Discuss the advantages and disadvantages of reusing construction materials
- (A) Frame up walls, floors, ceilings, roofs, stairs, doors, and windows
- (A) Select foundation appropriate to building sites
- (A) Identify energy-efficient insulation, heating and moisture management systems
Competency: Perform construction calculations

Tasks: Compute linear distance and angles

- Calculate measurements for construction plans and projects

- Use measurement and layout tools such as compass, protractor and squares, calculators, tapes and rulers

- Compute the area of regular geometric figures commonly encountered in construction projects

- Make drawings to scale

- Calculate quantities and cost of building materials

- Prepare thorough materials lists including unit prices, sub-totals and totals

Competency: Identify site selection considerations

Tasks: Name factors that affect site selection such as:

- a. cost
- b. weather exposure
- c. zoning
- d. flood or other natural dangers
- e. neighborhood
- f. geology (sub-surface characteristics)
- g. topography
- h. site preparation
- i. solar potential

(A) Layout a structure on a building site

Competency: Read blueprints

Tasks: Define blueprint terms

- Explain blueprints and their purposes

- Orient the blueprints

- Identify lines and symbols used on blueprints

- Explain blueprints specifications and instructions

- Translate blueprint scale measurements to actual measurements
Competency: Select and install insulation and vapor barriers

Tasks: Explain insulation and vapor barrier terms and principles

Identify and evaluate insulation materials on the basis of R-factor, longevity, and cost effectiveness

Discuss methods for installing insulation

Discuss the significance of R-factor for selecting insulation materials

Calculate the dollar value of energy savings attained through retrofitting existing structures to higher R-values

(A) Calculate pay back periods for various insulation systems

(A) Calculate BTU heating requirements for residential structures

(A) Contrast the R-values of building materials commonly used in log and frame construction

(A) Compare cost efficiency of different heating systems in existing structures given R-value and cubic footage

Competency: Identify alternative and energy-efficient home heating systems

Tasks: Define terms associated with energy-efficient home heating systems

Explain principles associated with energy-efficient home heating systems

Compare efficient energy technologies such as:

a. Multi-fuel heating systems
b. Dual heating systems
c. Sectional controls
d. Thermal storage
e. Heat pumps
f. Air to air heat exchanger

Compare substitute methods of heat or power generation such as:

a. Geothermal
b. Solar
c. Biomass
d. Wind energy
e. Hydro
Competency: Identify construction trade career opportunities

Tasks:

Discuss local and statewide career opportunities

Describe training requirements for various construction trades

Describe lifestyle considerations entailed in a variety of construction trades
Drafting

(A) Indicates Advanced Task or Competency

Competency: Follow drafting safety procedures
Tasks: Describe the first-aid procedures relevant to drafting
Maintain a clean and orderly work area

Competency: Care and store drafting equipment properly
Tasks: Explain equipment use and care
Adjust and calibrate equipment

Competency: Use drafting tools
Tasks: Identify types of drafting tools
Explain the proper use of the following tools:
  a. protractors
  b. triangles
  c. french curves
  d. templates
  e. erasing shields
  f. erasers
  g. drafting pencils
  h. t-squares
  i. drafting boards
  j. drafting tables

Competency: Letter and label title blocks correctly
Tasks: Define lettering and labeling terms
Describe lettering and labeling techniques
Explain standards of accuracy in form and spacing

Competency: Measure and scale drawings
Tasks: Use standard and metric rulers
Draw accurately
Produce drawings to the proper scale using a drafting scale
Scale drawings up and down using drafting scale
Competency: Complete standard orthographic drawings

Tasks: Define terms associated with orthographic drawings

Identify orthographic drawing techniques

Reproduce orthographic drawings to specified scales

Produce accurate orthographic drawings from rough sketches and isometric drawings

Produce an orthographic drawing of a rectangular object

Competency: Produce drawings

Tasks: Explain the difference between isometric, oblique, and one and two-point perspective drawings

Explain how to produce an accurate isometric drawing to scale

Explain how to produce an isometric drawing from an orthographic drawing

Explain how to make oblique and one and two point perspective drawings

Competency: Draw architectural plans for a small house

Tasks: Orient a house on a lot

Draw a floor plan

Draw an elevation view

(A) Detail plan

Competency: Identify occupations which require drafting skills

Tasks: Name and describe occupations requiring skill at creating or interpreting technical drawings

Contrast machine drafting with electrical drafting

Discuss the importance of drafting to electronic and computer design

Examine the applications of drafting in the field of architecture
Competency: (A) Complete drafting plans for a metal or woodworking project

Tasks: Sketch a project
Choose materials and hardware
Make working drawings
Identify proper orientation of drawings and plans
Interpret drawings

Competency: (A) Use a CAD (Computer Aided Drafting) system

Tasks: Explain CAD terms and principles
Discuss the limitations and advantages of CAD systems
Discuss current and potential CAD applications
Explain how to operate a CAD system
Electronics

(A) Indicates Advanced Task or Competency

Competency: Apply principles of electronics
Tasks: Explain electronic terms and principles

- Explain the theory of operation in AC and DC circuits of Ohm's Law, Kirchoff's Law, and Watt's Law involving resistors, coils, capacitors, and transistors
- Identify common electronic components and circuits
- Interpret general schematic diagrams
- Explain methods of electronic design

Competency: Set up a circuit
Tasks: Perform relevant mathematical calculations

- Explain relevant safety procedures
- Solve electronic circuit problems

Competency: Use electronic test equipment
Tasks: Use a multi-meter (volt-ohm meter)

- Describe how to select, purchase, use, and maintain electronic products
- Name various electronic controls
- Use basic electronic servicing equipment
- Examine a given electronic power system
- (A) Use an oscilloscope to verify signal patterns in consumer products

Competency: Service electronic devices
Tasks: Practice electronic soldering techniques

- Construct a PC board (layout, etch, drill)
- Locate component malfunctions
- Mount system in/on physical support
Record meter readings
Splice wires
Solder/unsolder components
Perform quality control checks

Competency: Identify careers in electronics

Tasks: Examine careers in:
  a. electrical engineering
  b. electrical power engineering
  c. electronic engineering
  d. electronic equipment design
  e. electronic equipment servicing
  f. public utilities

Competency: (R) Replace basic electronic components

Tasks: Replace fuse
       Replace IC chips and indicator lamps

Competency: (A) Clean electronic devices

Tasks: Assemble structural members according to an assembly drawing
       Clean:
       a. air filters
       b. chassis
       c. circulation fans (exhaust and intake)
       d. contact points
       e. drive mechanism
       f. reflective mirror
       g. speaker grill
       h. spindles
       i. tape head
       j. tape reader
       k. tuner
       l. volume control
Energy and Power

(A) Indicates Advanced Task or Competency

Competency: Apply principles of energy and power

Tasks: Explain terms and principles associated with energy and power generation, transmission and use

Contrast energy and power

Discuss entropy and inertia

Competency: Identify characteristics of available energy

Tasks: Name the characteristics of "available energy"

Identify major forms of energy

Identify examples of potential energy

List examples of kinetic energy

Competency: Apply principles of friction

Tasks: Define friction

Demonstrate natural effects of friction

Identify energy losses due to friction

Identify advantages and disadvantages of friction as a way to harness energy

(A) Discuss perpetual motion

Competency: Identify energy sources

Tasks: List terms describing various energy sources

Differentiate between renewable and non-renewable energy sources

Name the primary sources of world energy

List "exhaustible" sources of energy

Explain fossil fuel formation

Contrast fossil fuels such as crude oil, shale oil, tar sands, coal and natural gas
Identify the uses of major fossil fuels

Define factors which determine the viability of energy sources

(A) Discuss problems associated with energy extraction

Competency: Identify energy issues relevant for Alaska

Tasks: List major sources of energy in Alaska

Locate fossil fuel sources in America and Alaska and calculate their energy potential

Identify current methods of power generation in Alaska

Describe potential alternative energy sources for Alaska

Explain the terms and principles of hydroelectric generation

Locate hydroelectric power generation plants in Alaska

Explain considerations affecting Alaskan energy transportation or transmission, storage and consumption

Competency: Identify problems inherent in various energy systems

Tasks: Describe the history of American energy development

Identify basic principles of steam turbines

Trace the development and decline of the steam engine

Explain the development and use of wind power

Explain how environmental factors compound pollution problems

Identify problems associated with fossil fuels

Explain the problem of waste heat

Competency: Use English or American units of measurement

Tasks: Define foot-pound or inch-pound of work

Define British Thermal Units (BTU's)
Competency: Use metric measurements

Tasks: Explain basic metric measurements such as meters, liters, and kilos

Convert conventional measurement units to metric:

a. yard and meter
b. pound and kilometer
c. inch and centimeter
d. mile and kilometer
e. quart and liter

Competency: Measure energy

Tasks: Name important units of energy measurement

Name measuring devices used to compare inputs and outputs and to compare the efficiency of various power and energy systems

Identify important instruments for measuring energy

Read gas, water, and electrical meters

Determine which school or home appliances use the most energy

Calculate domestic and school energy consumption and costs

Competency: Understand energy utilization

Tasks: Explain a transactional system utilizing more than one energy source or power system

Describe various applications of energy and power in environmental control systems, production control systems, transportation systems, and communication systems

Compare the cost effectiveness of various power and energy systems

Discuss the implications of an existing or proposed power and energy system

Discuss ways to match power systems to jobs

Name ways to conserve energy in the school or home
Competency: Apply principles of mechanical power

Tasks: Explain terms and principles associated with mechanical power and its production

Contrast mechanical power with other energy forms

Competency: Understand mechanical advantages

Tasks: Define terms associated with mechanical advantages
Describe types of mechanical advantages
Name ways of determining mechanical advantages
Name machines using mechanical advantages
Explain how mechanical power changes input power
Explain the relationship between speed and force
Build a mechanical power system

(A) Explain the relationship between theoretical and mechanical advantages

Competency: Apply principles of simple machines

Tasks: Identify types of simple machines
Calculate the output force of simple machines
Sketch lever principle machines

(A) Sketch or create inclined plane machines

(A) Calculate the mechanical advantage of a wheel and axle system

Competency: Apply torque principles

Tasks: Explain torque terms and principles
Explain how torque is measured
Solve several torque problems
Tighten bolts to specs using a torque wrench
Competency: Identify mechanical energy systems

Tasks:
- Explain mechanical energy terms and principles
- Name common mechanical control devices
- Compare mechanical energy systems

Competency: Apply principles of gears and pulleys

Tasks:
- Explain how a pulley works
- Calculate the mechanical advantage of single and multiple pulleys
- Explain advantages of helical compared to spur gears
- Explain how clutches and worm gears work
- Contrast the efficiency of gears with those of chains and sprockets
(A) Compare the function of bevel, miter, and spur gears
(A) Calculate gear ratio problems

Competency: Identify belts and chains system

Tasks:
- List different types of belts
  (A) Explain the mechanical advantage of belt drives
  (A) Contrast advantages and disadvantages of belt drive systems
  (A) Name types of chain drives

Competency: Apply principles of fluid hydraulics

Tasks:
- Define and describe hydraulics
  (A) Describe the principles and theory of fluid power
  (A) Explain fluid pressure and how it is measured
  (A) Contrast pneumatics and fluidics
  (A) Construct a basic fluid power circle
  (A) Explain controlling liquids in mechanical devices
  (A) Sketch out how refrigeration works
Competency: Apply principles of electricity
Tasks: Define terms associated with electricity
Explain principles of electricity
Name the parts of an atom
Describe magnetism and explain its importance to electric motors
(A) Calculate the electrical charge of electrons and protons
(A) Contrast electrical energy with other energy forms
(A) Contrast electricity and electronics

Competency: Identify electrical power generation methods
Tasks: List sources of electrical power
List several types of power loads
Describe ways electrical energy is controlled
Discuss the present-day importance of steam in power and heat generation

Competency: Understand electrical circuits
Tasks: Explain electrical circuits and how they work
Identify the four basic components of a circuit
Define terms associated with electric circuits
Compare AC and DC systems

Competency: Identify basic electrical devices
Tasks: Explain how electric motors work
Identify common electrical devices and explain how they work
(A) Perform simple repairs and adjustments on an electro-mechanical system
(A) Analyze the performance of an electro-mechanical device
(A) Discuss solenoids and other electrical control devices
(A) Name important electrical sensing devices
Competency: Identify advanced uses of electricity

Tasks: Discuss important domestic applications of electricity
       Discuss important commercial applications of electricity
       (A) Define the role of electricity in communications systems
       (A) Explain basic principles of lasers and fiber optics
       (A) Describe how a laser works
       (A) Explain the use of electronic sensors
       (A) Explain the use of logic circuits

Competency: Identify environmental impacts of energy extraction and utilization

Tasks: Explain impacts of placer, strip, deep-shaft and evaporation mining
       Discuss acid rain and its causes
       Discuss the problem of tailing disposal, runoff, and reclamation
       Discuss sources and impacts of thermal and air pollution
       Discuss the sources and hazards of indoor pollution

Competency: Identify experimental and alternative energy systems

Tasks: Explain terms and principles associated with alternative energy systems
       Describe use and limitations of wind, wave, solar, tidal, and hydro power
       Explain the heat source of geothermal energy
       Locate geothermal sources in Alaska
       Explain biomass electrical generation
       (A) State the advantages of post windmill design
       (A) State the advantages of vertical rotor windmills
       (A) Describe the effect of blade angle on a multi-vane windmill
       (A) Describe a wind farm
       (A) Discuss wind speeds necessary for wind-powered electrical generation
Competency: Apply principles of light energy

Tasks: Define terms and explain principles associated with light energy
Contrast light with other energy forms
Explain the significance of the ozone layer and clouds to solar radiation
Explain the greenhouse effect
(A) Contrast incandescent and fluorescent light sources

Competency: Identify uses of solar energy

Tasks: Describe solar power and heating systems
Explain cost-effective uses of solar energy in homes
Define active and passive solar collecting systems
Demonstrate heating with solar energy
Name the chief uses of solar panels
Relate convection, conduction, and radiation to solar energy
Name requirements for successful employment of solar energy
Explain the significance of new window glazing strategies
Describe solar water heating systems
(A) Explain solar principles as applied to outer space energy systems
(A) Categorize types of solar reflection

Competency: Identify heat energy principles

Tasks: Explain heat energy terms and principles
Contrast heat with other energy forms
Explain how heat is generated from natural gas, electricity, fossil fuels, and biomass
Identify ways to conserve heat energy
Competency: Identify principles of heat conversion and transfer

Tasks: Explain principles of heat conversion in gas, electricity, and microwaves

- Explain the principles of heat transfer
- Describe how heat is generated in an automobile
- Name types of heat energy reservoirs
- Explain conversion of geothermal energy to electricity
- Define "hydrothermal", hot-dry rock, and "fracking"

Competency: Identify principles of steam energy for power generation

Tasks: Explain steam energy terms and principles

- Trace the development of the steam engine
- Diagram main steps in steam engine operation
- Name major classes of steam engines
- Explain the difference between a steam piston and steam turbine engine
- Name major uses of steam turbines
- List four methods to produce steam
- Diagram the power flow in Stirling engines
- Explain saturated and super heated steam

Competency: Identify principles of sound

Tasks: Explain sound terms and principles

- Contrast sound waves with other energy forms
- Explain how sound energy is produced
- Contrast pitch, frequency, amplitude and volume
- Contrast recording methods for different examples of stored sound energy (tapes, records, etc.)
- Define supersonic and ultrasonic
Name devices which utilize ultrasonic energy

(A) Identify the wave form by which sound energy is transmitted

Competency: Identify principles of radiation energy

Tasks: Contrast radiation with other energy forms

Define black body radiation (objects at night returning energy absorbed during the day), microwave radiation, and electromagnetic radiation

Competency: Identify principles of gravitational energy

Tasks: Explain gravitational energy terms and principles

Contrast gravitational with other energy forms

Identify sources of gravitational energy

Contrast advantages and disadvantages of gravity as an energy source

Explain how mechanical motion is created from gravitational energy

Explain how to utilize gravity to produce electricity with falling water

Define high head and low head

Explain how the water cycle represents potential energy

Explain how dams, reservoirs, and water towers store potential energy

Explain the gravity principle of ocean wave movement

Explain how ocean tides can be converted to electricity

Describe a gyroscope

Competency: Identify principles of nuclear energy

Tasks: Explain terms and principles associated with nuclear power generation

Compare fission and fusion

Contrast nuclear other energy forms

Identify fuels used to produce nuclear energy
Competency: Identify nuclear energy considerations

Tasks:
- Name human uses of nuclear energy
- Describe use of nuclear radiation in medicine
- Explain the problem of nuclear wastes
  - (A) Explain political and social ramifications of nuclear power generation

Competency: Identify how nuclear reactors work

Tasks:
- Contrast several types of nuclear reactors
- Describe the purpose of control rods
- Identify the heat source in a fission reactor
- Discuss nuclear fusion as a future energy source
- List ways fusion fuel (plasma) may be heated
- Name technical problems associated with nuclear fusion
  - (A) Describe principles of a light water reactor
  - (A) Explain the effect of moderators

Competency: Identify principles of energy conversion

Tasks:
- Explain energy conversion terms, principles, and methods
- Explain how energy is converted, transmitted, controlled, and applied
- Contrast direct and indirect energy conversion
- Explain the conversion of geothermal energy to electricity
- Discuss geothermal energy impacts
- Explain ways to convert wind and tidal energy to electricity
- Explain the conversion of animal wastes to electricity
Discuss the conversion of:

- wood fuel to heat
- coal to heat
- oil to heat
- light energy to heat
- light energy to electricity
- mechanical energy to electricity
- electrical energy to mechanical energy

(A) Discuss the indirect energy conversion process: electric to heat, light, and mechanical energy

(A) Explain the conversion of solar energy to electricity

(A) Explain the indirect energy conversion process of oil to heat to mechanical power

(A) Explain the indirect energy conversion process of nuclear to heat to mechanical power

(A) Explain the energy conversion principles of photosynthesis

Competency: Identify principles of energy transmission

Tasks: Explain energy transmission terms, principles and methods

Explain how electricity is transmitted

Define heat radiation

(A) Discuss how power is transferred through mechanical, fluid, and electrical devices

(A) Explain the importance of fiber optics to energy transmission

(A) Define conduction

(A) Describe the characteristics of a good electrical conductor

(A) Complete an experiment demonstrating energy transmission

(A) Explain ways that light energy is transmitted

(A) Explain ways that radiation energy is transmitted

(A) Describe principles of mechanical energy transmission

(A) Explain the use of gears and pulleys as a form of energy transmission
Competency: Identify principles of energy storage

Tasks:
- Explain energy storage terms, principles, and methods
- Describe characteristics of chemical and mechanical energy storage
- Describe tides in terms of energy storage
- (A) Explain characteristics of capacitative energy storage
- (A) Define characteristics of thermo-energy storage

Competency: Identify principles of chemical energy

Tasks:
- Contrast chemical energy with other energy forms
- Define plants as energy sources
- Define bio-chemical mixtures as energy sources
- Define piezo-chemical as an energy source
- Examine fossil fuels in terms of being chemical energy sources
- Define batteries as energy sources
- Identify types of chemical batteries
- Identify the voltage, characteristics and use of chemical batteries
- List dangers in handling batteries
- Describe characteristics of common battery types
- (A) Calculate the voltage, characteristics and use of several types of chemical batteries
- (A) Describe chemical electrical generation
- (A) Describe characteristics of nickel cadmium batteries and silver oxide batteries

Competency: Use energy and power safely

Tasks:
- Describe safe practices for working with power systems, tools and equipment
- Identify dangers associated with fossil fuel, hydro, and nuclear energy production, conversion, storage, transmission, and consumption
Competency: (A) Identify advanced applications of electro-mechanical technology

Tasks: Explain electro-mechanical terms, principles, and technologies

Survey a major electro-mechanical research and development project

Explain how more than one energy system may be employed in a single device

Discuss the applications of power as related to systems present in a device

Evaluate several electro-mechanical systems

Complete a power and energy system proposal

Explain principles of robotics

Competency: (A) Apply principles of pneumatics

Tasks: Explain pneumatic terms and principles

Explain controlling gases in mechanical devices

Explain important hydraulic power systems and how they work

Explain ways of converting mechanical power to fluid power
Forestry and Logging

(A) Indicates Advanced Task or Competency

Competency: Identify the role of forestry products in modern society
Tasks: Define modern forestry terms, principles and methods
Describe the development of the logging industry in the United States
Describe the importance of the forest industry to Alaska's economy
Describe the history of Alaska's forests
List forestry products

Competency: Use forestry tools
Tasks: Describe the proper use and care of forestry tools and equipment
(A) Cable splice in an eye splice with a marlin spike

Competency: Work safely
Tasks: Define terms and explain principles related to forestry safety
Describe ways to prevent accidents
Explain the importance of having first aid skills

Competency: Identify the role of fires in modern forestry
Tasks: Define the terms associated with forest fires, such as wildfires and controlled burns
Explain the principles associated with fire ecology
Explain important fire prevention and control techniques
Explain controlled burning techniques
Explain how to construct fire lines and operate water pumping equipment
Explain safe fire-fighting practices
Competency: Complete a rough land survey
Tasks: Identify basic surveying terminology and principles
  Use a hand compass
  Pace and measure a given plot
  Use a clinometer

Competency: Identify major commercial hardwood and softwood species
Tasks: Identify Alaskan tree species and their commercial value
  Explain the terms and principles associated with tree growth

Competency: Cruise and scale timber
Tasks: Explain timber cruising and scaling terms and principles
  Name tools and equipment needed for proper surveying and scaling
  Calculate diameters of standing trees and logs
  Calculate heights of standing trees and lengths of logs
  Calculate gross and net volumes
  Determine grades and defects of logs and timber stands

Competency: Identify timber harvesting techniques
Tasks: Identify logging terms, principles and techniques
  Discuss state and federal logging laws
  Develop a logging plan
  Explain how to properly climb a tree or pole, set chokers, and load and haul timber

Competency: Plant trees
Tasks: Identify tree planting terms, tools, principles and methods
  Plant seedlings
Competency: Identify raw materials used in forest product manufacturing

Tasks: Explain how forest products are processed

Match raw materials with end products in several types of wood manufacturing

Identify current or potential Alaska-manufactured wood products such as biomass energy production

(A) Properly use marlin spikes in cable splicing in an eye splice

Competency: Use a chain saw

Tasks: Describe and name the various parts of a chain saw

Explain saw, bar, and chain maintenance procedures

Explain chainsaw safety procedures and clothing for falling, bucking, carrying, transportation

Describe relevant fire regulations

Competency: Identify forestry employment opportunities

Tasks: Describe jobs in forestry such as:

a. logging
b. timber grading
c. forestry naturalist
d. sawmill worker
e. law enforcement
f. recreation
g. road building
h. reforestation

Locate important timber-producing areas in Alaska
Competency: Understand history of graphic communications
Tasks: List earliest forms of graphic communications
  Describe the history and impact on communications of:
  a. movable type and the printing press
  b. cameras
  c. computers
  Summarize the history of graphics in America: business

Competency: Identify the principles of graphics
Tasks: Describe graphics terms, principles, and techniques
  Describe graphics equipment, tools, and materials

Competency: Identify the elements of design
Tasks: Explain design terms, principles, and techniques

Competency: Identify typestyles and graphics
Tasks: Describe typestyles
  Define:
  a. font
  b. point
  c. type group
  d. family of type
  e. leading
  f. picas
  g. continuous tone in line copy
  Explain the use of clip art, charts, and other types of graphics

Competency: Layout a project
Tasks: Create a thumbnail sketch
  Create a rough layout
  Identify and use a proportional wheel
Create a comprehensive layout
Describe the process of stripping

**Competency: Identify printing supplies**

**Tasks:** Describe types of printing supplies
- Describe characteristics of printing inks
- Describe types of paper used in printing
- Describe various kinds of stencils and their solvents
- Identify corrosive and flammable printing chemicals

**Competency: Identify different printing processes**

**Tasks:** Define terms associated with graphic printing processes
- Identify materials, equipment, and techniques related to printing
- Determine printing needs
- Identify possible printing problems
- Describe how to:
  a. Create a lithograph
  b. Silk-screen
  c. Use the offset press
  d. Block print
  e. Letterpress
  f. Take a rubber stamp
  g. Gravura print
  h. Use flexography
  i. Ink jet
  j. Relief print

**Competency: Identify graphic production techniques**

**Tasks:** Describe binding techniques
- Demonstrate folding techniques
- Describe how to figure paper cuts from parent stock
- Define:
  a. ruling
  b. scoring
  c. perforating
  d. die cutting
  e. signatures
(A) Bind a document

Competency: Store and duplicate graphics

Tasks: Describe ways to store and protect graphics

Describe methods of graphic reproduction

Competency: Work safely

Tasks: Identify graphics and printing shop safety procedures

Identify common shop hazards

Describe safe use of common graphics and printing tools and equipment

Competency: Identify the parts of a camera

Tasks: Define the principles of photography

Describe the function of:

a. the camera lens
b. the shutter
c. f-stop or aperture
d. lens cap
e. light meters
f. viewfinders

describe important camera relationships such as:

a. F-stop and shutter speed
b. F-stop and depth of field

Explain how to care for cameras

(A) Demonstrate how to use precision photographic equipment

Competency: Identify types of cameras

Tasks: Describe camera types such as box, folding, reflex, and process cameras

Explain the function of various camera lenses such as: wide angle, macro, long lens, and 2 X extender

Define single lens reflex

Contrast 35mm with cartridge-film and instant cameras

Discuss the function of home video cameras for family and business photography
Competency: Identify types and functions of films

Tasks: Define terms associated with film

- Explain the principles associated with exposing and developing film
- Define the ASA rating of film
- Describe the common types of film and their uses
- Name types of film used in process camera work
- Describe the changes taking place on film during exposure
- Describe how prints and slides are made

Competency: Use a camera

Tasks: Load film

- Determine correct camera settings using light meter or film manufacturer's instructions
- Set camera shutter speed and F-stop
- Identify how to determine when film has all been used
- Rewind and unload film

(A) Take pictures illustrating:
  
  a. distracting background
  b. placement of horizontal lines
  c. formal photocomposition
  d. informal photocomposition

(A) Use different focusing techniques including:

  a. split image range finder
  b. coincidental range finder
  c. ground glass screen range finder

(A) Use a spot meter

Competency: Develop film and prints

Tasks: Explain developing terms, principles and techniques

- Explain safety precautions
  
  a. List the dangers in using photographic developing chemicals
  b. Demonstrate proper storage of photographic chemicals
  c. Explain proper methods of mixing developing photographic chemicals
Explain the purpose of darkrooms and safe lights

Competency: Identify careers in graphics

Tasks: Identify occupations in graphic arts

- Describe use and importance of graphics in business, industry and government

Competency: (A) Identify terms and concepts integral to graphic communications

Tasks: Define graphic communications

- Identify terms related to letterpress graphic technology
- Describe areas of greatest technical advancement in graphic arts
- Explain methods of graphic concept visualization
- Explain the importance of graphic size and shape

Competency: (A) Use a computer for graphic illustrations

Tasks: Identify basic computer components

- Identify applications of the computer in typesetting
- Explain CAD (Computer-Assisted Drafting) terms, principles and techniques
- Describe the use of computer keyboards
- Describe how to space, align, fit copy and make orthographic projections

Competency: (A) Typeset copy

Tasks: Explain typesetting terms, principles and procedures

- Identify the parameter parts of a typesetter
- Identify proof reading symbols
- Identify type sizes and styles
- Explain the types of paper used in typesetting
- Identify the proper ink for the printing process selected
Competency: Understand computer technology

Tasks: Identify terms and principles associated with computers

- Explain how a microcomputer works
- Explain uses of computers in offices, schools, and business operations

Competency: Understand robotic technology

Tasks: Identify robotics terms and principles

- Explain robotics safety practices
- Identify uses for low, medium, and high technology robots
- Explain the coordinate system defining a robot's movements
- Identify robot parts and features
- Discuss maintenance of robotic systems
- Explain several robot end-effectors
- Sketch out the "working envelope" for a robot
- Describe robotic "pick and place", "point-to-point", "continuous path" operations and their applications
- Discuss robotics' social and economic impacts

Competency: Understand Computer-Aided Drafting (CAD)

Tasks: Define CAD terms, principles and techniques

- Explain the components of a CAD system
- Explain basic two and three dimensional coordinates in the Cartesian system
- Describe functions of a CAD software package
Competency: Understand Computer-Aided Manufacturing (CAM)

Tasks: Define automation

- Define CAM terms, principles, and techniques
- Identify parts of a numerical control system
- Contrast numerical control (CN) systems with computer numerical control (CNC) systems
- Identify terms related to CNC systems
- Discuss interfaces between CAD and CAM systems

Competency: Understand satellite technology

Tasks: Explain satellite terms, principles, and technology

- Review the history of satellite technology
- Explain laws governing satellite communications
- Explain the significance of the Clark belt
- Describe the function of satellite system components including home satellite dishes

Competency: Use laser technology

Tasks: Explain laser terms, principles, and techniques

- Follow safety procedures
- Explain the various ratings of lasers
- Explain characteristics of laser beams
- Illustrate the spreading of the laser beam
- Split a laserbeam
- Change the direction of the laser beam
- Discuss fiber optics
- Use the laser to transmit a signal (such as a voice signal)
- Use a polarizer to vary the intensity of the laser beam
Competency: Use photovoltaic technology

Tasks: Identify photovoltaic terms

- Explain the principles of photovoltaics
- Determine the output parameters of a photovoltaic converter
- Identify characteristics of silicon cells
- Measure the efficiency of a photovoltaic converter

Competency: Identify jobs in high technology

Tasks: Describe jobs in:

- a. computers
- b. robotics
- c. CAD
- d. CAM
- e. satellite technology
- f. laser technology
- g. photovoltaic technology
Competency: Identify local climatic conditions requiring special gardening procedures

Tasks:
- Determine length of growing season
- Determine rainfall and air and soil temperature parameters during growing season
- Determine plants which can be grown locally
- Test soil
- Determine gardening procedures for your locale

Competency: Identify the potential for subsistence and commercial agriculture

Tasks:
- Identify crops grown in your locale
- Identify crops suitable for your locale
- Identify markets for locally-grown food products
- Identify food storage procedures such as root cellars

Competency: Plant a garden

Tasks:
- Select seed
- Prepare soils and other media
- Plant and transplant plant materials
- Fertilize and irrigate
- Maintain irrigation system
- Identify and control weeds, plant diseases and pests
- Harvest crops
- Prepare produce for sale, subsistence use, or storage
Competency: Plan and design a greenhouse

Tasks:

Discuss the amount and intensity of light and heat necessary for plant growth

- Determine light intensity
- Determine the angle of incidence for a particular structure
- Sketch a sun path diagram for a particular locale
- Discuss greenhouse sunspace demands
- Discuss supplemental lighting requirements for seedlings and mature plants
- Discuss the value of interior greenhouse reflective surfaces
- Contrast benefits of translucent and transparent glazing
- Contrast light diffusing abilities of glazing such as: fiberglass, polyethylene, polycarbonates, acrylics, and glass
- Describe the importance of air movement in greenhouses
- Contrast ways to store heat in the greenhouse
- Explain ways to protect greenhouse thermal mass from temperature extremes
- Contrast different types of growing media
- Identify ideal soil and water temperatures for various plants
- Sketch several possible greenhouse designs and compare their advantages
- Sketch several ways to use available interior space
- Compare advantages of raised beds
- Discuss plant shading and plant microclimates
- Complete the greenhouse floor plane
- Plan propagation beds
- Plan plant beds of proper depth and width
- Plan plant arrangement and spacing
- Discuss the greenhouse in terms of food and energy independence
Competency: Control greenhouse humidity

Tasks: Define relative humidity
       Calculate the relative humidity for the locale
       Explain ways to control greenhouse relative humidity

Competency: (A) Prepare a rich soil bed

Tasks: Locate a source of usable topsoil
       Explain how to make and sterilize soil
       Explain proper soil drainage
       Explain the problem of salt and mineral buildup and how to avoid it
       Test and adjust soil pH and fertility
       Discuss nutrients important for proper cultivation
       Discuss fertilization in terms of Liebig's Law of Minimum
       Compare advantages of different bed strategies

Competency: (A) Control air movement and temperature in the greenhouse

Tasks: Explain expected plant growth responses
       Discuss the problem of carbon dioxide depletion:
          a. in a closed greenhouse
          b. due to a lack of air motion
       Discuss the importance of air exchange
       Explain how to compost mulch to generate carbon dioxide

Competency: (A) Select crops for the greenhouse

Tasks: Explain how environment determines crops
       List potential plant varieties
       Select proper plant containers
       Discuss the issue of pollination
       Explain how to grow tomatoes using a spotlight
       Keep accurate records of planting dates, species, varieties, and performance
       Keep accurate records of expenses
Competency: (A) Control pests and diseases in the greenhouse

Tasks: Discuss methods of proper pest and disease prevention

Contrast biological versus chemical controls

Explain advantages of certain lighting and planting strategies in the control of pests and disease
Manufacturing

(A) Indicates Advanced Task or Competency

Competency: Identify major concepts of manufacturing

Tasks: Explain manufacturing terms, principles, and techniques

- Explain purchasing, distribution, packaging, labeling, and storing strategies
- Identify important service occupations related to manufacturing
- Explain the role of computers
- Define and give examples of jigs and fixtures

Competency: Identify resources used in manufacturing

Tasks: Describe raw materials and energy resources used in manufacturing

- Identify synthetic materials used in manufacturing and their sources
- Explain processes that convert raw materials to industrial stock
- Explain processes that recycle materials into industrial stock

Competency: Identify major steps in the manufacturing process

Tasks: Define the steps in manufacturing

- Trace the development of manufacturing
- Describe how economics effects manufacturing
- Describe the process of mass production
- Define "interchangeability of parts" and "economies of scale"
- Identify environmental considerations in the manufacturing process
- List reasons for consumer surveys and test marketing

Competency: Identify company organization strategies

Tasks: Define organizational terms and principles

- Describe an organizational structure
Explain ownership terms such as corporation, partnerships, sole proprietor, and publically and privately-owned.

**Competency:** Identify the role of management in a manufacturing enterprise

**Tasks:** Explain management's responsibilities to:

- a. the company
- b. employees
- c. customers
- d. the general public

Explain employee responsibilities

**Competency:** Identify the function of research and development in manufacturing

**Tasks:** Explain the role of research and development

- Define and give examples of pure and applied research
- Explain how new products are researched
- Explain the significance of spin-offs
- Name common products resulting from space-related research

**Competency:** Calculate manufacturing problems

**Tasks:** Describe manufacturing layout and measurement processes

- Convert fractions to decimals and decimals to fractions
- Convert standard dimensions to metric and metric dimensions to standard
- Calculate amount of stock required in machine work
- Calculate feeds and speeds
- Calculate for angular and simple indexing
- Calculate tap drill sizes
- Calculate tolerances and allowances

**Competency:** Assemble bench work

**Tasks:** Identify terms and principles associated with bench work

Assemble or disassemble work with an arbor press
Bench file a work piece
Explain care for hand tools

Competency: Perform bench work

Tasks: Maintain a safe working environment
        Saw materials
        Thread with tap and die
        Drill holes
        Grind parts
        Hand whet cutting tools
        Hone a work piece
        Inspect and change shop drive pulleys and belts
        Install a helical coil wire insert
        Lap surfaces
        Locate holes with transfer screws and punches
        Mark locations with a prick and center punches
        Ream holes
        Work and shape metal or wood
        Polish metal or finish wood

Competency: Maintain precision machine parts

Tasks: Remove and install dowel pins
        Remove and replace broken drills, taps, screws, and machine parts
        Straighten work piece and arbor press

Competency: Operate a drill press

Tasks: Clean and lubricate the drill press
        Mount a work on V-blocks
        Counterbore and countersink holes to specifications
        Drill a hole to size
Drill a hole with an automatic feed on the drill press
Drill a work piece with a drill jig
Lap a hole to size
Ream holes to size

Competency: (A) Organize a manufacturing company

Tasks:
- Identify major steps in planning a business
- Identify start-up capital needs and sources
- Describe the relationship of manufacturing to big business
- Develop an organizational chart
- Identify major start-up problems and their solutions

Competency: (A) Design a mass production project

Tasks:
- Discuss and choose a saleable product
- Organize flow charts
- Determine critical paths
- Contrast company and industry standards
- Identify appropriate drafting symbols
- Interpret and work from multi-view drawings
- Calculate missing dimensions
- Sketch the work to be produced
- Identify and explain the use of measuring and layout tools
- Explain the importance of accuracy

Competency: (A) Plan and enter production

Tasks:
- Explain safety procedures
- Tool up for production
- Determine clearances and tolerances
- Set up jigs and fixtures
Set up an assembly line
Set up work stations and management positions
Build, inspect, and test prototypes
Modify processes as required
Establish and follow quality controls
Metals

(A) Indicates Advanced Task or Competency

Competency: Identify characteristics of commonly-worked metals

Tasks: Define the terms and principles associated with metallurgy

Trace the formation of a given metal product from ore extraction to product sale

Identify samples of common metals and metal ores

Explain heat flow and its application to bending and forming metals

Identify the appropriate metals for selected projects

(A) Differentiate between iron and steel

(A) Identify raw materials used in ferrous and nonferrous metals

(A) Describe qualities of materials made of aluminum or aluminum alloy

(A) List major manufacturing uses of iron and steel

(A) List the raw materials needed to make aluminum

(A) Identify properties which create the need for steel classifications and interpret data from resource information

Competency: Construct projects using shop drawings

Tasks: Read and follow metalworking specifications and directions

Measure and machine to accuracy specified

Sketch or draw a metal project plan

Measure angles to the nearest degree

Competency: Apply metalworking techniques

Tasks: Explain metalworking terms, principles, and techniques

Identify metalworking tools and their proper use and care

Identify metalworking rules and regulations

Identify the relationship between speed and feed

Describe the process of heat treatment with plain carbon steels
Identify methods for joining metal together
Interpret working drawings
Store and maintain all metalworking equipment
Utilize techniques for bench metalwork including drilling, tapping, bending, and fitting
Employ a variety of standard techniques for sheet-metalwork such as riveting, soldering, layout, bending, forming, and finishing
Operate the metal lathe including turning between centers, turning with a chuck, turning a taper, knurling, and drilling
Explain techniques for forging such as bending, shaping, fitting, and heat-treating
Cut mild steel with a gas cutting-torch

(A) Identify procedures for processing metals
(A) Use the spark testing technique to differentiate high carbon from low carbon steel
(A) Describe the casting process

Competency: Use appropriate welding technique

Tasks: Define the terms, principles and techniques associated with welding
Explain how to determine the appropriate welding technique for the materials
Explain the use of arc and gas welders for flat welding applications
Select proper arc welding electrodes
Describe dress and safety procedures for welding
Maintain welding tools
Prepare surfaces to be welded
Remove burrs and sharp edges with a file
Describe how to determine the quality of a weld
Competency: Calculate material costs
Tasks: Calculate material needs
List sizes, quantities, and unit and total costs

Competency: Use common fastening devices
Tasks: Describe different types of fasteners and their applications
Identify types and sizes of screws and rivets and their uses
Practice several common methods of clamping

Competency: Measure and calculate accurately
Tasks: Read common measurement tools such as:
   a. Tape measures
   b. Squares
   c. Rulers
   d. Protractors
   e. Micrometers
   f. Vernier gauge
   g. Calipers
Use decimal and metric equivalents

Competency: Arc weld
Tasks: Identify all parts of an arc welding machine and related equipment
Identify a proper arc welding set up
Safely use arc welding equipment
Demonstrate stick welding techniques
Properly position and secure the cables and welding project prior to beginning arc welding
Select the proper amperage and current flow
Properly clean and prepare metals prior to arc welding
Select and use proper rods and flux
Position and secure the cables and welding project
(A) Safely weld overhead
(A) Safely weld butt, overlap, and T-joints in the flat, horizontal and vertical positions

(A) Identify electric welding processes commonly used in industry

Competency: Use oxy-acetylene welding equipment

Tasks: Select the appropriate welding or brazing process for shop projects

Identify all parts of an oxy-acetylene gas welding set up

Assemble and adjust an oxy-acetylene welding set and regulators

Follow the proper procedure for turning on and shutting down the oxy-acetylene equipment

Describe metals which are potentially hazardous

Keep a properly adjusted flame at the torch tip

Identify the uses and purposes of using flux materials

Choose the appropriate cutting tip

Make welds and cuts

Make accurate straight or curved cuts

Perform butt, overlap and "T" weld joints

Properly store and maintain welding equipment

Use brazing techniques

(A) Utilize drawings and measurements for oxy-acetylene and arc welding equipment

(A) Explain properties of different types of metals as affected by gas welding

Competency: Heat, form and bend metal

Tasks: Explain terms, principles, and techniques for heating, bending, and forming different metals

Explain forging techniques with mild steel

(A) Identify temperature of steel by color changes
Competency: Identify jobs in metalworking and welding

Tasks: Describe special training required for metalworking and welding

Describe entry-level in metalworking and welding positions

Identify the impact of automation, robots, and computerized assembly on the welding trades
Mining and Petroleum

Competency: Identify geological theories

Tasks: Discuss theories of the formation of the earth

- Explain the layers of the earth including, crust, mantle, outer core, inner core
- Discuss the size, shape, and average density of the earth
- Differentiate between sedimentary, igneous and metamorphic rock
- Explain the relationship between plate tectonics and mineral deposits
- Explain the relationship between weathering processes and mineral deposits

Competency: Identify mineral location and extraction techniques

Tasks: Describe mining exploration, development, and processing

- Differentiate between strip, pit, tunnel, placer and evaporation mining
- Explain ways of pillaring mines
- Explain ways to safely deal with explosives

Competency: Identify mining issues

Tasks: Discuss the importance of minerals to society

- Trace the importance of gold to Alaska's development
- Explain the reasons for building the Alaska railroad
- Explain the relationship between mining and the growth of aviation and highways in Alaska
- Explain how markets determine whether deposits are developed
- Explain the Pacific Rim and its importance as a market for Alaska's minerals
- Locate other mineral exporting nations on the Pacific Rim
- Explain the competitive advantages and disadvantages of different nations on the Pacific Rim
Explain the importance of developing markets for Alaska's minerals.

Name minerals important to Alaska's mining industry including:
   a. sand and gravel
   b. gold
   c. coal
   d. building stone

Explain the basic minerals used in building and construction, including:
   a. iron
   b. stone
   c. gypsum
   d. limestone
   e. clay

Define strategic minerals.

Identify mineralized areas in Alaska.

Locate Alaskan seaports suitable for shipping minerals.

Explain Alaska mineral transportation problems.

Explain the importance of Alaska's coal reserves.

Identify economic factors affecting marketing of minerals.

Identify costs and other factors affecting choice of mining systems.

Identify social and economic problems related to developing non-renewable resources.

Explain environmental concerns related to mining in Alaska.

Identify conflicts between mining and conservation interests.

Competency: Identify jobs in the mining industry.

Tasks: Explain the job of:
   a. prospector
   b. geologist
   c. mining engineer
   d. ore processing engineer
   e. placer miner
   f. heavy equipment operator
   g. state and federal mining regulators
Competency: Identify the history of oil exploration

Tasks: Explain how oil is formed
    Describe oil exploration techniques
    Describe the relationship between the automobile use and the availability of cheap oil

Competency: Identify the importance of oil to Alaska's economy

Tasks: Name the major oil-producing nations
    Describe the importance of oil to industrial economies
    Locate important Alaskan oilfields
    Describe the relationship between the Alaska pipeline and the Alaska Native Claims Settlement Act (ANCSA)
    Describe the construction of the trans-Alaska oil pipeline
    Identify the impact of state and local regulations and taxes on oil development
    Describe the future of the oil and gas industry in Alaska
    Explain the impact of nuclear power on the petroleum industry
    Explain the impact of power from organic waste on the petroleum industry

Competency: Identify petroleum drilling and production techniques

Tasks: Explain oil and gas drilling techniques
    Explain methods of blowout prevention
    Name drilling innovations
    Identify different types of wells
    Describe how to plug a well
    Explain how a well is completed
    Explain the factors determining the life of oil wells
    Name ways to control production
    Identify ways to stimulate production and enhance oil recovery
Competency: Identify the importance of alternative fuel development

Tasks: Explain the importance of increasing energy production and finding new energy sources

   - Explain the importance of oil shale and tar sands to expanding energy sources

   - Explain how coal is liquified for fuel

   - Explain the impact of renewable energy sources on the petroleum industry

   - Explain the impact of solar, wind, and ocean energy sources on the petroleum industry

   - Explain the impact of alcohol fuel and geothermal power on the petroleum industry

   - Identify the value of petroleum products in environmental and health research

   - Discuss conservation's role as an energy source

Competency: Identify environmental impacts of energy extraction

Tasks: Explain ways the petroleum industry needs to protect the environment including:

   a. reducing emissions and odors at refineries
   b. producing low-sulfur heating oil and residual fuel oil
   c. returning water to rivers or streams at the same or an improved purity
   d. reducing refinery discharges
   e. preventing, controlling, cleaning up, and monitoring oil spills
   f. reimbursing victims of oil spills
   g. preventing and controlling offshore blowouts

   - Explain ways to prevent oil spills

   - Identify environmental safeguards in pipelines and refineries

   - Identify the relationship between burning fossil fuels and the greenhouse effect
Competency: Identify petroleum transportation methods

Tasks: Describe marine, road, and rail transportation methods
      Describe pipeline systems and their operation
      Contrast types of pipelines, including gathering lines, crude oil
      trunk lines, and product trunk lines

Competency: Identify petrochemical refining and manufacturing processes

Tasks: Identify petrochemical manufacturing terms and principles
      Explain refining processes
      Identify the petrochemical "building blocks"
      Explain the manufacturing of petrochemicals
      Identify methods of waste control

Competency: Identify petroleum products and their uses

Tasks: Describe the use of petroleum products such as:
   a. gasoline
   b. diesel fuels
   c. fuel oils
   d. asphalt
   e. jet fuel
   f. plastics
   g. geotextiles
   h. other consumer products
      Identify the manufacture and uses of kerosene
      Identify the manufacture and uses of liquefied petroleum gas (LPG)
      Identify the manufacture and uses of aviation gasoline
      Describe the issue of petroleum product quality

Competency: Identify methods of marketing oil products

Tasks: Describe moving oil products to market
      Explain the issue of intermediate stops such as terminals and bulk
      plants in moving oil products to market
      Explain the business of gasoline retailing
      Explain the marketing of other petroleum products
Competency: Identify jobs in the oil industry

Tasks: Explain how to apply for a job/training in Alaska's oil and gas industry

Explain how to enroll in the Alaska Petroleum Extension Program

Describe the job of:

a. petroleum engineer/engineer's aide
b. operator
c. instrument technician
d. drilling/floorhand (roughneck)
e. maintenance personnel
Small Engine Maintenance

Competency: Work safely

Tasks: Dress appropriately for small-engine work

Explain the proper use of specialized tools such as bearing drivers, oil-seal pullers and drivers, wheel pullers and pulley pullers, and torque wrenches and spanner wrenches

Identify shop emergency, first-aid, and clean-up procedures

Competency: Maintain electrical and ignition systems of small engines

Tasks: Identify terms and principles associated with the operation and maintenance of small engine electrical and ignition systems

Describe the function of electricity in the operation of small engines

Explain the function of ignition components such as:

a. sparkplug
b. coil
c. points or sensor coil
d. condenser
e. flywheel magnet
f. capacitance discharge systems
g. cam

Contrast ignition systems such as electronic or magneto

Explain timing

Test and troubleshoot ignition components such as coils, plugs and condensers

Competency: Maintain fuel systems common to small engines

Tasks: Identify terms and principles associated with operating and maintaining fuel systems

Identify fuels and mixtures for two-cycle, four cycle, and diesel engines

Diagram small-engine carburetors, fuel pumps, filters, connectors, lines, and fittings as well as contrasting the flow of fuel from carburetor to combustion area in one and two-cycle engines

Identify, adjust, and repair throttles and shift controls
Disassemble, reassemble, and adjust carburetors

Identify and explain governors

Identify carburetor features and functions including:

a. choke  
b. throttle butterfly  
c. venturi  
d. high speed needle or orifice  
e. slow speed needle  
f. float or diaphragm metering assembly  
g. inlet needle valve

Contrast ways fuel can be delivered to the carburetor

Troubleshoot and repair small engine fuel pumps, filters, connectors, lines and fittings

Competency: Maintain lubrication systems used in two- and four-cycle small engines

Tasks: Identify terms and principles associated with operation and maintenance of lubrication systems

Describe the role of lubrication

Describe the effects of lubrication system failures

Contrast the properties of common small engine lubricating engine oils

Contrast small engines lubrication systems

Identify and contrast the applications of a variety of bearing types including:

a. ball bearings  
b. roller bearings  
c. needle bearings  
d. babbit or bushing bearings  
e. thrust washers or bearings

Troubleshoot bearing and lubrication failures

Competency: Use engine manuals and parts lists

Tasks: Describe how to use engine manuals and parts lists

Locate information in small-engine manuals such as:

a. engine specifications  
b. repair procedures  
c. part numbers, prices, and sources
Calculate prices from parts lists and shipping costs

Perform small engine repair operations by following repair
manual instructions

Competency: Use small engine fasteners

Tasks: Identify small engine fastener, terms, types, and principles

- Compare the size, strength, and applications of bolt and machine
  screws, washers, lock washers and rings, screws, pins, keys, and
  nuts commonly utilized in small engines
- Identify thread sizes and types
- Properly drill and tap as needed
- Use grease and "lock-tight" on bolts and other fasteners

Competency: Use appropriate gaskets and seals

Tasks: Explain gasket and seal terms and principles

- Identify the types of gasket materials used in small engines
- Identify and replace "0" ring and oil seals

Competency: Understand two- and four-cycle engines

Tasks: Contrast two- and four-cycle engines

- Describe proper oil and gas mixing and storage procedures
- Describe winterization procedures
- Describe diagnostic tests and routine maintenance
- Explain the role of cooling systems and the consequences of their
  failure
- Explain the functions of crankcase vacuum and reed valve operation
- Explain intake and exhaust valve mechanical systems and their
  significance

Competency: Understand diesel engine operation and repair

Tasks: Explain diesel engine terms, principles, and technology

- Contrast basic engine characteristics of diesel and gasoline engine
Describe compression in diesel engines
Contrast combustion in diesel and gasoline engines

Competency: Install small engines

Tasks: Follow manufacturer's instructions
Secure small engines with bolts before testing
Install muffler assemblies
Replace protective guards on chains, gears, shafts or flywheels before operating

Competency: Maintain and repair small marine engines

Tasks: Identify terms and principles associated with marine engine use and maintenance
Explain the effects of corrosion
Explain corrosion prevention and repair procedures
Identify mechanical and electrical parts unique to outboard engines such as:
   a. skegs
   b. cavitation plates
   c. lower units
   d. water pumps
   e. water intakes
   f. exhaust housings
   g. zinc plates
   h. trim tabs
   i. shear pins

Explain the role of prop pitch and diameter in performance

Competency: Troubleshoot small engines systematically

Tasks: Explain systematic approaches to troubleshooting engines and engine systems

Competency: Describe career opportunities in small engine repair

Tasks: Describe entry-level positions
   Describe personal traits and training requirements
Technological Impacts

Competency: Identify technological impacts of highways

Tasks: Describe the loss of farm lands to highways

Discuss how a highway can impact an area

Explain changes in human interactions when remote areas become accessible by road

Explain changes in wildlife populations when areas become accessible by road

Competency: Identify technological impacts of communication

Tasks: Describe how a village or town changes with the introduction of telephone and television

Explain the impact of "instant mail" and computer communications on society

Describe the use of satellite communications

Competency: Identify social concerns relative to production

Tasks: Explain how the availability of work affects communities

Identify the social changes in Alaska which are likely to result from the industrialization of Alaska

Competency: Identify conservation concerns

Tasks: Explain conservation

Explain how the recent creation of national parks, monuments, and wildlife refuges has affected Alaska's industry

Explain various uses of Alaska's native lands in relation to subsistence and revenue production

Competency: Identify social concerns relative to inventions

Tasks: Explain how the introduction of aircraft, high-powered rifles and ATV's has affected Alaskans

Discuss use of new inventions in Alaska such as hydrofoils in Southeast or high-speed rail transportation in the Railbelt
Competency: Identify effects of air pollution

Tasks: Define types of pollution
- Identify reasons pollution is often ignored instead of alleviated
- Relate cancer and other diseases with industrial pollution
- Compare the amount of pollution produced by various types of fuel
- Describe the chemical reaction that forms smog
- Contrast smog and ice fog
- Locate areas prone to smog in the United States and Alaska
- Identify effects of smog
- Name polluting particulates
- Describe the role of wood stoves in air pollution
- Discuss sources and effects of indoor air pollution
- Describe how agricultural practices contribute to air pollution

Competency: Identify acid rain concerns

Tasks: Describe terms and principles associated with acid rain
- Explain the water cycle
- Describe the significance of acid rain
- Explain factors that compound the problem of acid rain
- Identify geographical areas most affected by acid rain

Competency: Identify effects of thermal pollution on lakes and streams

Tasks: Identify terms and principles associated with thermal pollution
- Explain why power plants produce waste
- Identify ways that waste is dissipated in modern power plants and industrial processes
Competency: Identify impacts of power generation

Tasks: Explain impacts of:

- a. coal-generated power
- b. nuclear-generated power
- c. using wastes for power generation
- d. using petroleum-based power generation

Explain impacts of alternative methods of power generation such as:

- a. wind generation
- b. ocean power
- c. biomass power
- d. hydro power

Competency: Identify ways to conserve natural resources

Tasks: Describe alternatives to non-renewable energy sources such as synfuel or gasohol

Describe substitutes to traditional sources of materials such as using plastic for copper pipe

Describe the limitations of using substitutes

Describe new technologies which help conserve resources

Competency: Identify ways to conserve energy

Tasks: Identify the role of mass transportation in energy conservation

Identify the effect of car pooling and energy efficient automobiles

Identify the effect of tuning automotive engines, replacing air filters, and properly inflating tires on energy conservation

Identify the effect of upgrading house insulation on energy conservation

Identify the role of public education on energy conservation

Competency: Identify ways to control hazardous wastes

Tasks: Identify several types of hazardous wastes

Explain ways to minimize production of hazardous wastes

Explain possible effects of improper disposal of hazardous wastes

Name possible safe ways to transport and dispose of hazardous wastes
Transportation

Competency: Understand the importance of marine shipping to Alaska

Tasks: List major types of marine transportation
- Describe inland waterways in the United States
- Locate the world's major seacanes on a map
- Locate Alaska's ports on a map
- Locate the Inside Passage and Alaska's navigable rivers on a map
- Describe the historical importance of marine shipping to Alaska
- Explain the purpose and significance of the Jones Act and other shipping regulations
- Explain the advantages of container shipping
- Describe longshoremen jobs in Alaska
- Discuss the potential for more shipping jobs due to increased Alaskan exports to Pacific Rim Markets

Competency: Understand the importance of land shipping to Alaska

Tasks: Describe historical and contemporary transportation to Interior, Northern, Western, and Southwestern Alaska
- Describe the construction of the Alaska highway
- List and locate surface rail systems
- Locate Alaska's major highways on a map
- Describe importance of commercial truck transport

Competency: Identify ways of transporting hazardous materials

Tasks: Explain safety concerns related to transporting hazardous materials
- Identify hazardous materials currently being transported in Alaska
- Describe recent accidents involving the transportation of hazardous materials in Alaska
Describe ways to safely transport hazardous materials by rail, truck, ship and air

Competency: Apply aerodynamic principles

Tasks: Explain aerodynamic terms, principles, and techniques
- Sketch a cross section of an airplane wing
- Explain Bernoulli's principle and airfoil lift with moving air
- Relate airplane wing shape to angle of attack
- Explain air current eddies
- Explain skin friction, drag, and airspeed
- Identify design characteristics which contribute to skin friction and lift
- Contrast sub- and supersonic aircraft designs
- Identify the purpose of wind tunnels
- Explain how designers improve aircraft efficiency
- Explain the basic operation of the rotor-vane, piston, turbine, and jet aircraft engines
- Explain aircraft safety considerations and procedures

Competency: Understand the importance of air transportation in Alaska

Tasks: Locate important Alaska air transportation centers on a map
- Compare the costs of air shipping with those of surface transportation in Alaska
- Name major Alaskan communities not on the state road system
- Describe the issue of subsidies for air transportation in Alaska

Competency: Identify alternative methods of transportation

Tasks: Locate the world's high-speed rail systems
- Describe possible contemporary uses of wind for transportation
- Trace the development of supersonic transports (SST's)
- Describe the "Orient Express" (high-speed space transporter)
Competency: Identify the characteristics of shipping jobs

Tasks: Explain the job of:

a. shipping supervisor
b. dispatcher
c. rate clerk
d. sales representative
e. maintenance man
f. truck driver
g. handler
h. warehouse worker/foreman
i. delivery
j. security

Competency: Identify jobs related to highway transportation in Alaska

Tasks: Describe jobs in:

a. transportation-oil industry
b. traffic engineering
c. licensing drivers
d. traffic enforcement
e. traffic court
f. recycling
g. traffic safety
h. automotive sales and service
i. highway construction and landscaping

Describe trucking jobs:

a. tractor driver
b. tractor owner/operator
c. dispatching and warehousing

Competency: Identify jobs related to air travel

Tasks: Describe airline industry jobs in Alaska

Explain the training required for these jobs

Competency: Identify jobs in tourism

Tasks: Describe jobs:

a. on cruiselines
b. in boat and aircraft charter operations
c. in tour bus operations
Wiring and Plumbing

(A) Indicates Advanced Task or Competency

Competency: Work safely

Tasks: Describe safe procedures for working with electricity

Locate safety equipment, escape routes and emergency exits

Demonstrate the safe use of mechanical equipment

Describe the importance of wearing safety goggles, aprons, and shoes

Competency: Use hand and power tools safely

Tasks: Identify tools utilized in house wiring assignments including specialized varieties of pliers, strippers, wrenches, saws, and drills as well as reamer, brace, conduit bender, and electrical tester

Describe proper hand and power tool use

Describe capabilities and applications of common electrical tools

Name common wiring materials and discuss their applications

Competency: Wire safely

Tasks: Explain safe wiring principles and techniques

Identify and explain applicable building and electrical codes

Splice wires utilizing mechanical connectors

Describe and execute Western Union, tap, and pigtail solder splices

Follow standard grounding procedures

Prepare and install an electrical service entrance and service panel

Install wiring for standard outlet configurations including split-wired outlets

Install lighting circuits including switch-controlled and fluorescent lights

(A) Read kilowatt-hour meters and calculate corresponding utilities charges
(A) Install a main electrical panel and single-pole and double-pole circuit breakers

(A) Wire a variety of common household electrical devices including photo-electric switches, timer circuits, dimmer switches, and thermostats

(A) Discuss procedures for wiring outlets to household appliances including portable appliances such as radios, stationary appliances such as washing machines, and fixed appliances such as water heaters

(A) Compare the materials and procedures for outdoor and indoor wiring

(A) Calculate circuit loads

(A) Design and layout hypothetical circuits for a house so as to minimize the possibility of electrical overload

(A) Layout household lighting circuits in accordance with appropriate electrical codes including NEC

(A) Layout a wiring plan for a cabin or other small residential structure

(A) Estimate the materials and costs associated with wiring plans

(A) Install electrical metallic tubing and flexible conduit for joining circuit boxes

(A) Install electrical metallic tubing in accordance with electrical codes including NEC

(A) Install and test motor-starting equipment

Competency: Apply plumbing principles

Tasks: Explain plumbing terms, principles, and methods

Explain the purpose and history of plumbing systems

Sketch isometric drawings of water and wastewater systems for multi-story structures

Describe relevant safety practices, such as insuring adequate ventilation when working with volatile and toxic compounds and preventing fires when working with torches and candles

Identify all applicable building and plumbing codes

Explain how to insulate plumbing systems and protect from temperature extremes
Competency: Make proper plumbing measurements

Tasks: Make an end to center measurement

Strike a straight line on a level surface using a chalk line

Make center to center, face to face, and back to back measurements

Grade a length of pipe with a level and with a hose

Measure using the plumb bob and rule

Competency: Repair home plumbing

Tasks: Replace:

a. basket strainer
b. water closet
c. faucet washer and seat
d. lavatory faucet
e. kitchen sink trap
f. ball cock
g. flush valve
h. lavatory trap
i. tank gasket
j. kitchen sink faucet
k. PO plug
l. tub shoe and overflow
m. clogged drains and sewer

Competency: Install copper pipe

Tasks: Identify terms and principles associated with copper pipe

Clean copper pipe, copper tube, and fittings

Bend copper pipe

Cut copper tubing and pipe with tubing cutters and hacksaws

Flare copper tube using hammer-type and screw-type flaring tools

Assemble a torch kit

Bend copper tube using lever-type bender

Prepare a copper joint using:

a. compression fittings
b. flare fittings
c. a copper solder joint
d. silver solder copper joint

Test system
Competency: Install plastic pipe

Tasks: Saw plastic pipe

Cut plastic pipe using tubing cutters

Prepare a:

a. polyethylene plastic tube joint
b. solvent weld plastic pipe joint

Test system

(A) Prepare a flare fitting plastic tube joint

Competency: Support and hang pipe

Tasks: Identify plumbing codes and manufacturing instructions

Strap pipe using pipe straps

Install backing boards for fixtures

Install toggle bolt anchor

Competency: Replace fixtures

Tasks: Describe how to repair or replace:

a. a tank-type water closet
d. a kitchen sink

e. a flush valve type water closet
f. a garbage disposal
g. a tub and shower valve

Competency: Identify jobs in plumbing and wiring

Tasks: Describe entry-level positions in trades involving plumbing and electrical wiring

Describe the jobs of construction and maintenance electrician and plumber
Woodworking

(A) Indicates Advanced Task or Competency

Competency: Work safely

Tasks: Describe safe shop procedures

Locate safety equipment, escape routes, and emergency exits

Demonstrate the safe use of mechanical equipment

Describe the importance of wearing safety goggles, aprons, respirators, and shoes

Competency: Identify woodworking principles

Tasks: Describe woodworking terms and principles

Describe wood drying and curing techniques

Explain lumber processing, grading, and selection

Calculate board feet required for a specified project design

Identify, compare, and use a variety of layout and measurement tools

Describe the importance of proper planning and drafting

Name sources for obtaining woodworking project plans

Competency: Use and maintain hand tools

Tasks: Describe how to use and maintain:

a. hammers and mallets
b. hand, coping and miter saws
c. hand and special purpose planes
d. spokeshaves, draw knives, and scrapers
e. hand drills, bits, braces, and drill presses
f. files, rasps and abrasive papers
g. chisels and carving tools
h. vises
i. staple guns
j. countersinks
Competency: Use and maintain power tools

Tasks: Describe how to use and maintain:

a. hand-held power tools including the sabre saw, power drill, and portable circular saw
b. radial arm, band, and circular table saws
c. sanders
d. lathes
e. turning chisels
f. drill presses
g. power grinders and jointers
h. planers or large sanders

Competency: Complete a basic woodworking project

Tasks: Develop and follow written plans

Calculate materials

Use measuring devices including tapes, rules, and calipers to specified accuracy

Plan, layout, measure, cut, fit and install optimally

Adapt the written project plan as necessary during construction

Describe, select, and use a combination of wood joining methods, including dowels, pins, and clamps and glue

(A) Use corner irons and T-plates

(A) Identify, describe, and utilize a variety of joints including miter, dado, lap, butt, dovetail joints, mortise and tenon and other cabinetry joints

(A) Use hand screws, bar clamps, C-clamps, miter clamps, and spring clamps

(A) Lay out irregular shapes, curves, and geometric forms in wood

Competency: Identify woodworking career opportunities

Tasks: Describe entry-level positions in cabinet and construction trades

Discuss the application of woodworking skills to marine and residential restoration and repair projects
Competency: (A) Complete an advanced woodworking project

Tasks: Develop written plans and designs after consulting several sources

- Calculate materials
- Draw up a bill of materials
- Select, measure, lay out and cut materials accurately and optimally
- Lay out irregular shapes, curves, and geometric forms
- Use saws, lathes, planes, reamers, drills, and routers
- Explain how to use a variety of joints including miter, dado, lap, butt, dovetail, mortise, tenon and other cabinetry joints
- Select and use a combination of joinery methods such as screws, pins, hinges, glues, and dowels and bar, C, miter, and spring clamps
- Use corner irons and T-plates
- Adapt the written project plan as necessary during construction
This course is a self-contained curriculum in which students will learn the principles of technology and how to apply those concepts to the mechanical, fluid, electrical, and thermal energy systems found in technological devices.

The curriculum was developed through a multi-state consortium. Materials for this course include instructional guides for the teacher and student and student demonstration lab stations.

Vendors who supply the Principles of Technology materials include:

- **Broadhead-Garrett Company**
  4560 East 71st Street
  Cleveland, OH 44105
  (216) 341-0248

- **Energy Concepts, Inc.**
  3254 North Kilbourn
  Chicago, IL 60641
  (312) 283-4422

- **Sargent-Welch Scientific Company**
  P.O. Box 1026
  Skokie, IL 60077
  (312) 677-0600

- **Scientific Labs, Inc.**
  P.O. Box 803788
  Houston, TX 77280
  (713) 464-6068

**Competency:** Apply the principles of force as related to different systems

**Tasks:**
- Identify the components of force in a mechanical system
- Identify the components of pressure in a fluid system
- Identify the instruments of temperature in a thermal system
- Identify the force of voltage in an electrical system
- Calculate force applications in different systems

**Competency:** Identify the principles of work as related to different systems

**Tasks:**
- Explain the work done by winches and pulleys in a mechanical system
- Explain the work done by pistons and pumps in a fluid system
- Describe the work done by motors and solenoids in an electrical system
- Calculate work applications in different systems
Competency: Relate principles of "rate" in different technological systems

Tasks: Measure linear and angular rate in different mechanical systems

- Measure liquid flow and gas-flow rates in fluid systems
- Measure current and frequency in a thermal system
- Determine heatflow and cooling rates in a thermal system
- Calculate rate in different systems

Competency: Apply principles of resistance in different scientific systems

Tasks: Define friction and its properties

- Explain how lubricants reduce friction
- Explain how streamlining reduces air drag
- Describe resistance in a fluid and air system
- Use Ohm's law to determine resistance in an electrical system
- Measure resistance in a thermal system
- Explain the importance of proper insulation in a thermal system
- Calculate resistance in different systems

Competency: Apply principles of energy used in different technological systems

Tasks: Describe energy in a mechanical system

- Measure potential energy in a mechanical system
- Measure stored energy in a hydraulic system
- Define the use of compressed energy in a pneumatic system
- Describe energy in an electrical system
- Explain energy and temperature transfers as they relate to thermal systems
- Calculate energy of different systems
Competency: Apply the principles of power as related to different systems

Tasks: Identify linear and rotating power in a mechanical system
Describe hydraulic power in a fluid system
Describe air power in a pneumatic system
Measure the amount of electrical energy in an electrical system
Explain the efficiency of motors and generators in an electrical system
Calculate power in different systems

Competency: Apply the principles of force transformers in different systems

Tasks: Contrast the force transformers in a linear mechanical system
Define the types of force transformers in a rotational mechanical system
Describe the use of force transformers in an electrical and hydraulic systems
Explain pressure intensifiers in fluid systems
Calculate force transformers in different systems
Course Descriptions

The brief course descriptions provide conceptual frameworks for educational planners that seek to design and implement a balanced program in industrial education. Teachers can use these descriptions to organize course offerings in industrial education. These descriptions are examples of content organization and are too brief for purposes of program approval. Local schools will need to be much more definitive regarding the content of their courses than is reflected in these course descriptions.

Course: Industrial Education I, II, (etc.)
Length: One Semester/One Year
Grades: 6-12

Industrial Education is a course(s) which provide students with exploratory experiences and basic occupational skills in several industrial education areas. The specific course content of industrial education should be based on the employment potential in the local community, region and state.

The number of units included in an industrial education course will depend on the desired depth for each unit, and should be between four and eight units for a one year course.

Course: Advanced Principles of Technology I
Length: One Year
Grades: 11-12

Advanced Principles of Technology is a course in applied physics for those who plan to pursue careers as technicians. It is a course that blends an understanding of basics and principles with practice and builds a firm foundation for understanding technology. The curriculum for this program was developed through a multi-state consortium and is available from the Vocational Materials Library.

The content of Advanced Principles of Technology I is made up of the following seven units: Force, Work, Rate, Resistance, Energy, Power, and Force Transformers.

Course: Advanced Principles of Technology II
Length: One Year
Grades: 12

The second level of Advanced Principles of Technology builds upon the principles learned in the first course. It is a course that blends an understanding of basics and principles with practice and builds a firm foundation for understanding technology.

The content of Advanced Principles of Technology II is made up of the following seven units: Momentum, Waves and Vibrations, Energy Convertors, Transducers, Radiation, Optical Systems, and Time Constants.
Curriculum Analysis Matrix
Curriculum Analysis Matrix

Identified Competencies by Course Offerings

This competency checklist should be used by teachers in identifying competencies to be included in specific classes in industrial education. This checklist is a curriculum analysis tool for use by teachers in assigning responsibilities for the competencies of a total industrial education program.

All courses taught in the industrial education program are identified in the columns at the top of the matrix. The individual competencies can be allocated to specific courses. One method for analyzing the competency list is to assign letters where the competency will be introduced (I), taught (T), or mastered (M). Curriculum sequences can be organized through this approach.

To assist industrial education teachers to reinforce basic skills instruction, competencies have been cross-referenced with the following academic areas:

- Math (M)
- Science (S)
- Social Studies (SS)
- Language Arts (LA)

This will assist local school districts in awarding cross-credit (academic credit) for participation in vocational classes they deem appropriate.

The following checklists are also cross-referenced with the Job Training Partnership Act pre-employment competencies and student leadership competencies. The Job Training Partnership Act provides funds to train economically disadvantaged youth to enter and succeed in employment. Each Private Industry Council responsible for administering these funds adopted youth pre-employment competencies as one of the measures for positive termination for program participants. The other measures are attained through unsubsidized employment, or through another training program.

The following categories of work-related knowledge must be evaluated and measured in the course of a participant's enrollment in a JTPA program:

1. Pre-Employment Competencies, which require the participant to demonstrate the skills and knowledge necessary to identify career objectives, seek and obtain employment and understand job performance.
2. Work Maturity Competencies, which require the participant to demonstrate the ability to apply skills in a training position.
3. Educational Skills Competencies, which require the participant to demonstrate basic computation and communication skills necessary to enter the labor market.
4. Occupational Skills Competencies, which require that the participant demonstrate proficiency in those skills necessary to maintain employment in a specific occupation or occupational cluster.
The pre-employment and work maturity competencies have been specifically cross-referenced in this curriculum so that industrial education instructors could specify where these competencies are integrated into the curriculum.

These youth competencies were identified by the Vice Presidents of the Task Force on Youth Employment, Private Sector/Education Roundtables: Summary Report 1979 as critical elements for employability of the nation's youth.

Student leadership programs are designed to be an integral part of the curriculum. The competencies are reinforced by student participation in approved student organizations such as Vocational Industrial Clubs of America. The student leadership competencies have been cross-referenced in this handbook to assist the industrial education instructor identify specifically where these competencies will be taught.

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)

Vocational Industrial Clubs of America (VICA) is for students enrolled in secondary and postsecondary vocational courses in trade, industrial, technical and health education.

Through planned club activities, VICA develops the "whole" student, social and leadership abilities as well as vocational skills. The VICA motto is "Preparing for Leadership in the World of Work." VICA goals include:

- Foster an understanding of the functions of labor and management organizations and a recognition of their interdependence.
- Foster respect for the dignity of work.
- Relate school experiences to a young person's search for meaning, identity and achievement.
- Teach young people how to live and work with others...to accept and be accepted.
- Offer activities that complement occupational skill development.

VICA goals include:

- Create interest in and stimulate favorable community response to trade, industrial, technical and health occupations education.
- Promote high standards in work ethics, craftsmanship, scholarship and safety.
- Help students understand their roles in a technological age.

Alaska VICA, chartered in 1973, serves about 140 members in 10 chapters. The national organization is located in Leesburg, Virginia.

KEY

M Math
SS Social Studies
S Science
LA Language Arts
* Pre-Employment Competencies
+ Student Leadership Competencies
# Recommended Competencies by Course Offerings

## Competencies

<table>
<thead>
<tr>
<th>EMPLOYABILITY SKILLS</th>
<th>Advanced Principles of Technology I</th>
<th>Industrial Education II</th>
<th>Industrial Education I</th>
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<tbody>
<tr>
<td>*</td>
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<tr>
<td>+</td>
<td>Identify career choices</td>
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<tr>
<td>+</td>
<td>Identify jobs using industrial education skill training</td>
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<tr>
<td>*</td>
<td>Identify employment opportunities</td>
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<tr>
<td>+</td>
<td>Prepare a resume and job application</td>
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<tr>
<td>+</td>
<td>Write a cover letter</td>
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<tr>
<td>+</td>
<td>Prepare for an interview</td>
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<tr>
<td>+</td>
<td>Follow up the interview</td>
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<td>+</td>
<td>Dress appropriately on the job</td>
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<tr>
<td>S</td>
<td>Prevent work-related injuries</td>
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<tr>
<td>+</td>
<td>Be reliable and dependable</td>
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<tr>
<td>*</td>
<td>Maintain good personal relations</td>
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## Recommended Competencies by Course Offerings

### Competencies

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<thead>
<tr>
<th></th>
<th>Be honest</th>
<th>Industrial Education I</th>
<th>Industrial Education II</th>
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<tbody>
<tr>
<td></td>
<td>Demonstrate initiative and productivity</td>
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<tr>
<td></td>
<td>Be assertive</td>
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<tr>
<td></td>
<td>Demonstrate work maturity</td>
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<td></td>
<td>Identify personal responsibilities related to employment</td>
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<td></td>
<td>Maintain good health for effective job performance</td>
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<tr>
<td></td>
<td>Identify employee rights and responsibilities</td>
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<td></td>
<td>Follow OSHA guidelines</td>
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<td></td>
<td>Follow verbal and written directions</td>
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<tr>
<td></td>
<td>Apply reading and writing skills</td>
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<tr>
<td></td>
<td>Use effective leadership skills</td>
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<td></td>
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<tr>
<td></td>
<td>Solve problems</td>
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# Recommended Competencies by Course Offerings

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Industrial Education I</th>
<th>Industrial Education II</th>
<th>Advanced Principles of Technology I</th>
<th>Advanced Principles of Technology II</th>
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<tr>
<td>* LA Identify proper termination procedures</td>
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<tr>
<td><strong>AUTO MAINTENANCE</strong></td>
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<tr>
<td>SS Understand automotive history</td>
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<tr>
<td>S Identify internal combustion engine terms, principles, and technology</td>
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<tr>
<td>S Work safely</td>
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<tr>
<td>S Understand the value of systematic diagnosis</td>
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<tr>
<td>S Maintain automotive cooling systems</td>
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<tr>
<td>S Maintain automotive fuel systems</td>
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<tr>
<td>S Maintain automotive electrical systems</td>
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<tr>
<td>S Maintain automotive lubrication systems</td>
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<tr>
<td>S Maintain automotive pollution control systems</td>
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<tr>
<td>S Maintain automotive braking systems</td>
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Recommended Competencies by Course Offerings

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<th>Industrial Education II</th>
<th>Technology II</th>
<th>Advanced Principles of Technology I</th>
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<tr>
<td>Maintain automotive steering systems</td>
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<td>Maintain automotive suspension systems</td>
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<tr>
<td>Maintain automotive chassis systems</td>
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<tr>
<td>Maintain automotive transmission systems</td>
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<tr>
<td>Maintain automotive heating and air conditioning systems</td>
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<tr>
<td>Maintain automotive hydraulic systems</td>
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<tr>
<td>Perform routine maintenance and tuneups</td>
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<tr>
<td>Winterize automotive systems</td>
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<tr>
<td>(A) Map automotive systems</td>
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<tr>
<td>(A) Apply automotive maintenance skills</td>
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<tr>
<td><strong>BUILDING MAINTENANCE</strong></td>
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<tr>
<td>Maintain building floors</td>
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### Recommended Competencies by Course Offerings

<table>
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<th>Industrial Education</th>
<th>Advanced Principles of Technology</th>
<th>Advanced Principles of Technology</th>
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<tbody>
<tr>
<td>Use and maintain cleaning equipment</td>
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<tr>
<td>Clean walls and windows</td>
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<tr>
<td>Clean carpet</td>
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<tr>
<td>Maintain light fixtures</td>
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<tr>
<td>Fix basic electrical problems</td>
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<tr>
<td>Repair and paint damaged walls</td>
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<tr>
<td>Clean and polish surfaces</td>
<td></td>
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<tr>
<td>Maintain basic plumbing</td>
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<tr>
<td>Service heating and other building support equipment</td>
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<tr>
<td>Secure building and property</td>
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<tr>
<td>Safely store materials and chemicals</td>
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<tr>
<td>Perform outdoor building maintenance</td>
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<tr>
<td>Competencies</td>
<td>Industrial EducationI</td>
<td>Advanced Principles of Technology I</td>
<td>Advanced Principles of Technology II</td>
<td>Industrial EducationII</td>
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<tr>
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<tr>
<td>Care for lawn and shrubbery</td>
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<tr>
<td>Dispose of trash</td>
<td></td>
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<tr>
<td>Maintain rest rooms</td>
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<tr>
<td>COMMERCIAL FISHING</td>
<td></td>
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</tr>
<tr>
<td>Identify the harvesting and processing of marine products</td>
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<tr>
<td>Correctly handle, process and market marine products</td>
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<tr>
<td>Use good boating safety and seamanship</td>
<td></td>
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</tr>
<tr>
<td>(A) Get a vessel underway</td>
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<tr>
<td>(A) Maneuver a vessel</td>
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<tr>
<td>(A) Conduct deckhand duties</td>
<td></td>
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<tr>
<td>(A) Anchor a vessel</td>
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<tr>
<td>(A) Dock a vessel</td>
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</tbody>
</table>
## Recommended Competencies by Course Offerings

**Competencies**

| SM | (A) Conduct line fishing duties |
| SM | (A) Perform pot and trawl fisher duties |
| SM | (A) Conduct net fishing duties |
| SM | (A) Maintain vessels |
| SM | (A) Prepare meals aboard the vessel |
| SM | (A) Perform vessel emergency procedures |
| SM | (A) Maintain and operate fish processing and preservation equipment |
| SM | (A) Maintain fish quality |

### COMMUNICATIONS

| SM | Identify the principles of light and sound transmission |
| SM | Understand how the telephone works |
| SM | Understand how the radio works |
### Recommended Competencies by Course Offerings

#### Competencies

<table>
<thead>
<tr>
<th>SMSS</th>
<th>Understand how a television functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMSS</td>
<td>Identify recent innovations in home communications</td>
</tr>
<tr>
<td>SMSS</td>
<td>Identify uses of citizens band and amateur radios</td>
</tr>
<tr>
<td>SMSS</td>
<td>Identify computer communications methods and systems</td>
</tr>
<tr>
<td>SS LA</td>
<td>Analyze the effects of telecommunications on society</td>
</tr>
</tbody>
</table>

#### CONSTRUCTION

<table>
<thead>
<tr>
<th>SSSS</th>
<th>Work safely</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSSS</td>
<td>Use common construction tools and materials</td>
</tr>
<tr>
<td>SSM</td>
<td>Perform construction calculations</td>
</tr>
<tr>
<td>SSMSS</td>
<td>Identify site selection considerations</td>
</tr>
<tr>
<td>SMLA</td>
<td>Read blueprints</td>
</tr>
<tr>
<td>SMSS</td>
<td>Select and install insulation and vapor barriers</td>
</tr>
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</table>
### Recommended Competencies by Course Offerings

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Advanced Principles of Technology I</th>
<th>Advanced Principles of Technology II</th>
<th>Industrial Education I</th>
<th>Industrial Education II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify alternative and energy-efficient home heating systems</td>
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<tr>
<td>Identify construction trade career opportunities</td>
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<tr>
<td><strong>DRAFTING</strong></td>
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<tr>
<td>Follow drafting safety procedures</td>
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<tr>
<td>Care and store drafting equipment properly</td>
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<tr>
<td>Use drafting tools</td>
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<tr>
<td>Letter and label title blocks correctly</td>
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<tr>
<td>Measure and scale drawings</td>
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<tr>
<td>Complete standard orthographic drawings</td>
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<tr>
<td>Produce drawings</td>
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<tr>
<td>Draw architectural plans for a small house</td>
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<tr>
<td>Identify occupations which require drafting skills</td>
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## Recommended Competencies by Course Offerings

### Competencies

<table>
<thead>
<tr>
<th>SM</th>
<th>ELECTRONICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM</td>
<td>(A) Complete drafting plans for a metal or woodworking project</td>
</tr>
<tr>
<td>SM</td>
<td>(A) Use a CAD (Computer-Aided Drafting) system</td>
</tr>
</tbody>
</table>

#### ELECTRONICS

- Apply principles of electronics
- Set up a circuit
- Use electronic test equipment
- Service electronic devices
- Identify careers in electronics
- (A) Replace basic electronic components
- (A) Clean electronic devices

#### ENERGY AND POWER

- Apply principles of energy and power
<table>
<thead>
<tr>
<th>Competencies</th>
<th>Industrial Education</th>
<th>Technical Prac. of Technol. I</th>
<th>Technical Prac. of Technol. II</th>
<th>Technical Prac. of Technol. III</th>
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<tbody>
<tr>
<td>Identify characteristics of available energy</td>
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<tr>
<td>Apply principles of friction</td>
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<tr>
<td>Identify energy sources</td>
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<tr>
<td>Identify energy issues relevant for Alaska</td>
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<tr>
<td>Identify problems inherent in various energy systems</td>
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<tr>
<td>Use English or American units of measurement</td>
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<tr>
<td>Use metric measurements</td>
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<tr>
<td>Measure energy</td>
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<tr>
<td>Understand energy utilization</td>
<td></td>
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<tr>
<td>Apply principles of mechanical power</td>
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<tr>
<td>Understand mechanical advantages</td>
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<tr>
<td>Apply principles of simple machines</td>
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## Recommended Competencies by Course Offerings

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<tr>
<th>Competencies</th>
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<tbody>
<tr>
<td>Apply torque principles</td>
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<tr>
<td>Identify mechanical energy systems</td>
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<tr>
<td>Apply principles of gears and pulleys</td>
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<tr>
<td>Identify belts and chains system</td>
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<tr>
<td>Apply principles of fluid hydraulics</td>
<td></td>
<td></td>
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<tr>
<td>Apply principles of electricity</td>
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<td></td>
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<tr>
<td>Identify electrical power generation methods</td>
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<tr>
<td>Understand electrical circuits</td>
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<tr>
<td>Identify basic electrical devices</td>
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<tr>
<td>Identify advanced uses of electricity</td>
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<tr>
<td>Identify environmental impacts of energy extraction and utilization</td>
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<tr>
<td>Identify experimental and alternative energy systems</td>
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<td>Competencies</td>
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<tr>
<td>Apply principles of light energy</td>
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<td>Identify uses of solar energy</td>
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<td>Identify heat energy principles</td>
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<td>Identify principles of heat conversion and transfer</td>
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<td>Identify the principles of steam energy for power generation</td>
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<td>Identify principles of sound</td>
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<td>Identify principles of radiation energy</td>
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<td>Identify principles of gravitational energy</td>
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<td>Identify principles of nuclear energy</td>
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<td>Identify nuclear energy considerations</td>
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<tr>
<td>Identify how nuclear reactors work</td>
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### Recommended Competencies by Course Offerings

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<tbody>
<tr>
<td><strong>S</strong> Identify principles of energy transmission</td>
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<td><strong>S</strong> Identify principles of energy storage</td>
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<tr>
<td><strong>S</strong> Identify principles of chemical energy</td>
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<tr>
<td><strong>S</strong> Use energy and power safely</td>
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<tr>
<td><strong>S</strong> (A) Identify advanced applications of electro-mechanical technology</td>
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</tr>
<tr>
<td><strong>S</strong> (A) Apply principles of pneumatics</td>
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<tr>
<td><strong>FORESTRY AND LOGGING</strong></td>
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<tr>
<td><strong>S</strong> Identify the role of forestry products in modern society</td>
<td></td>
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<tr>
<td><strong>S</strong> Use forestry tools</td>
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<tr>
<td><strong>S</strong> Work safely</td>
<td></td>
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<tr>
<td><strong>S</strong> Identify the role of fires in modern forestry</td>
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</tr>
<tr>
<td><strong>S</strong> Complete a rough land survey</td>
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<td>Advanced Principles of Technology I</td>
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<td>----------------------------------------------------------------------------</td>
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<tr>
<td>Identify major commercial hardwood and softwood species</td>
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<tr>
<td>Cruise and scale timber</td>
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<tr>
<td>Identify timber harvesting techniques</td>
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<tr>
<td>Plant trees</td>
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<tr>
<td>Identify raw materials used in forest product manufacturing</td>
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<tr>
<td>Use a chain saw</td>
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<tr>
<td>Identify forestry employment opportunities</td>
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<tr>
<td><strong>GRAPHICS</strong></td>
<td></td>
</tr>
<tr>
<td>Understand history of graphic communications</td>
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<tr>
<td>Identify the principles of graphics</td>
<td></td>
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<tr>
<td>Identify the elements of design</td>
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<tr>
<td>Identify typestyles and graphics</td>
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<tr>
<td>SM LA</td>
<td>Competency</td>
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<tr>
<td></td>
<td>Layout a project</td>
</tr>
<tr>
<td>S</td>
<td>Identify printing supplies</td>
</tr>
<tr>
<td>S</td>
<td>Identify different printing processes</td>
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<tr>
<td>S</td>
<td>Identify graphic production techniques</td>
</tr>
<tr>
<td>S</td>
<td>Store and duplicate graphics</td>
</tr>
<tr>
<td>S</td>
<td>Work safely</td>
</tr>
<tr>
<td>S</td>
<td>Identify the parts of a camera</td>
</tr>
<tr>
<td>S</td>
<td>Identify types of cameras</td>
</tr>
<tr>
<td>S</td>
<td>Identify types and functions of films</td>
</tr>
<tr>
<td>S LA</td>
<td>Use a camera</td>
</tr>
<tr>
<td>S M</td>
<td>Develop film and prints</td>
</tr>
<tr>
<td>SS</td>
<td>Identify careers in graphics</td>
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**Recommended Competencies by Course Offerings**
### Recommended Competencies by Course Offerings

**Competencies**

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<thead>
<tr>
<th>Competency</th>
<th>Course Offerings</th>
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<tbody>
<tr>
<td>(A) Identify terms and concepts integral to graphic communications</td>
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<tr>
<td>(A) Use a computer for graphic illustrations</td>
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<tr>
<td>(A) Typeset copy</td>
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<tr>
<td><strong>HIGH TECHNOLOGY</strong></td>
<td></td>
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<tr>
<td>Understand computer technology</td>
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<tr>
<td>Understand robotic technology</td>
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<tr>
<td>Understand Computer-Aided Drafting (CAD)</td>
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<tr>
<td>Understand Computer-Aided Manufacturing (CAM)</td>
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<tr>
<td>Understand satellite technology</td>
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<tr>
<td>Use laser technology</td>
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<tr>
<td>Use photovoltaic technology</td>
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<tr>
<td>Identify jobs in high technology</td>
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<tr>
<td>MANUFACTURING</td>
<td>HORTICULTURE</td>
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<tr>
<td>Identify major concepts of manufacturing</td>
<td>Identify local climactic conditions requiring special gardening procedures</td>
</tr>
<tr>
<td>(A) Control pests and diseases in the greenhouse</td>
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<tr>
<td>(A) Select crops for the greenhouse</td>
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<tr>
<td>(A) Control air movement and temperature in the greenhouse</td>
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<tr>
<td>(A) Prepare a rich soil bed</td>
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<tr>
<td>Control greenhouse humidity</td>
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<tr>
<td>Plan and design a greenhouse</td>
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<tr>
<td>Plan a garden</td>
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<tr>
<td>Identify the potential for subsistence and commercial agriculture</td>
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</table>

**MANUFACTURING Competencies**

1. Identify major concepts of manufacturing
2. Control pests and diseases in the greenhouse
3. Select crops for the greenhouse
4. Control air movement and temperature in the greenhouse
5. Prepare a rich soil bed
6. Control greenhouse humidity
7. Plan and design a greenhouse
8. Plan a garden
9. Identify the potential for subsistence and commercial agriculture

**HORTICULTURE Competencies**

1. Identify local climactic conditions requiring special gardening procedures
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<th>Industrial Education I</th>
<th>Advanced Principles of Technology II</th>
<th>Advanced Principles of Technology I</th>
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<tr>
<td>Identify resources used in manufacturing</td>
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<td>Identify major steps in the manufacturing process</td>
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<td>Identify company organization strategies</td>
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<tr>
<td>Identify the role of management in a manufacturing enterprise</td>
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<tr>
<td>Identify the function of research and development in manufacturing</td>
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<tr>
<td>Calculate manufacturing problems</td>
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<tr>
<td>Assemble bench work</td>
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<tr>
<td>Perform bench work</td>
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<tr>
<td>Maintain precision machine parts</td>
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<tr>
<td>Operate a drill press</td>
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<tr>
<td>(A) Organize a manufacturing company</td>
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<tr>
<td>(A) Design a mass production project</td>
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### Recommended Competencies by Course Offerings

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<tr>
<td><strong>METALS</strong></td>
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<tr>
<td>(A) Plan and enter production</td>
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<tr>
<td>Identify characteristics of commonly-worked metals</td>
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<tr>
<td>Construct projects using shop drawings</td>
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<tr>
<td>Apply metalworking techniques</td>
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<tr>
<td>Use appropriate welding technique</td>
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<tr>
<td>Calculate material costs</td>
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<tr>
<td>Use common fastening devices</td>
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<tr>
<td>Measure and calculate accurately</td>
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<tr>
<td>Arc weld</td>
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<tr>
<td>Use oxy-acetylene welding equipment</td>
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<tr>
<td>Heat, form, and bend metal</td>
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## Recommended Competencies by Course Offerings

### Competencies

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<tbody>
<tr>
<td><strong>SS</strong> Identify jobs in metalworking and welding</td>
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<tr>
<td><strong>MINING AND PETROLEUM</strong></td>
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<tr>
<td><strong>S</strong> Identify geological theories</td>
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<tr>
<td><strong>S</strong> Identify mineral location and extraction techniques</td>
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<tr>
<td><strong>S</strong> Identify mining issues</td>
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<tr>
<td><strong>SS</strong> Identify jobs in the mining industry</td>
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<tr>
<td><strong>SS</strong> Identify the history of oil exploration</td>
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<tr>
<td><strong>S</strong> Identify the importance of oil to Alaska's economy</td>
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<tr>
<td><strong>S</strong> Identify petroleum drilling and production techniques</td>
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<tr>
<td><strong>SS</strong> Identify petroleum transportation methods</td>
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<tr>
<td><strong>S</strong> Identify petrochemical refining and manufacturing processes</td>
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<tr>
<td><strong>SS</strong> Identify petroleum products and their uses</td>
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### Recommended Competencies by Course Offerings

#### Competencies

| SS | Identify methods of marketing oil products |
| SS | Identify the importance of alternative fuel development |
| SS | Identify environmental impacts of energy extraction |
| SS | Identify jobs in the oil industry |

**SMALL ENGINE MAINTENANCE**

| S  | Work safely |
| S  | Maintain electrical and ignition systems of small engines |
| S  | Maintain fuel systems common to small engines |
| S  | Maintain lubrication systems used in two- and four-cycles small engines |

| MSIA | Use engine manuals and parts lists |
| S    | Use small engine fasteners |
| S    | Use appropriate gaskets and seals |
## Recommended Competencies by Course Offerings

<table>
<thead>
<tr>
<th>Competencies</th>
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<th>Industrial Education</th>
<th>Advanced Principles of Technology I</th>
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<tbody>
<tr>
<td>Understand two- and four-cycle engines</td>
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<tr>
<td>Understand diesel engine operation and repair</td>
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<tr>
<td>Install small engines</td>
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<tr>
<td>Maintain and repair small marine engines</td>
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<tr>
<td>Troubleshoot small engines systematically</td>
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<tr>
<td>Describe career opportunities in small engine repair</td>
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## Technological Impacts

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<tr>
<td>Identify technological impacts of highways</td>
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<tr>
<td>Identify technological impacts of communications</td>
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<tr>
<td>Identify social concerns relative to production</td>
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<tr>
<td>Identify conservation concerns</td>
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<tr>
<td>Identify social concerns relative to inventions</td>
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### Recommended Competencies by Course Offerings

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<tbody>
<tr>
<td>Identify effects of air pollution</td>
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<td>Identify acid rain concerns</td>
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<tr>
<td>Identify effects of thermal pollution on lakes and streams</td>
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<tr>
<td>Identify impacts of power generation</td>
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<tr>
<td>Identify ways to conserve natural resources</td>
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<td>Identify ways to conserve energy</td>
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<tr>
<td>Identify ways to control hazardous wastes</td>
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<tr>
<td><strong>TRANSPORTATION</strong></td>
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<tr>
<td>Understand the importance of marine shipping to Alaska</td>
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<tr>
<td>Understand the importance of land shipping to Alaska</td>
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<tr>
<td>Identify ways of transporting hazardous materials</td>
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<tr>
<td>Apply aerodynamic principles</td>
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### Recommended Competencies by Course Offerings

**Competencies**

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<tr>
<th>Competency</th>
<th>Industrial Technology I</th>
<th>Industrial Technology II</th>
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<tbody>
<tr>
<td>Understand the importance of air transportation in Alaska</td>
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<tr>
<td>Identify alternative methods of transportation</td>
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<tr>
<td>Identify characteristics of shipping jobs</td>
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<tr>
<td>Identify jobs related to highway transportation in Alaska</td>
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<tr>
<td>Identify jobs related to air travel</td>
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<tr>
<td>Identify jobs in tourism</td>
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<tr>
<td><strong>Wiring and Plumbing</strong></td>
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<tr>
<td>Work safely</td>
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<tr>
<td>Use hand and power tools safely</td>
<td></td>
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<tr>
<td>Wire safely</td>
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<tr>
<td>Apply plumbing principles</td>
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<tr>
<td>Make proper plumbing measurements</td>
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# Recommended Competencies by Course Offerings

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<th>Competencies</th>
<th>Industrial Education I</th>
<th>Industrial Education II</th>
<th>Advanced Principles of Technology I</th>
<th>Advanced Principles of Technology II</th>
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<tbody>
<tr>
<td>S Repair home plumbing</td>
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<tr>
<td>S Install copper pipe</td>
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<tr>
<td>S Install plastic pipe</td>
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<tr>
<td>S Support and hang pipe</td>
<td></td>
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</tr>
<tr>
<td>S Replace fixtures</td>
<td></td>
<td></td>
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<tr>
<td>SS Identify jobs in plumbing and wiring</td>
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<tr>
<td><strong>WOODWORKING</strong></td>
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<tr>
<td>S Work safely</td>
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<tr>
<td>M S Identify woodworking principles</td>
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<tr>
<td>S Use and maintain hand tools</td>
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<tr>
<td>S Use and maintain power tools</td>
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<tr>
<td>M S Complete a basic woodworking project</td>
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## Recommended Competencies by Course Offerings

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<th>Advanced Principles of Technology I</th>
<th>Advanced Principles of Technology II</th>
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<tbody>
<tr>
<td><strong>SS</strong> Identify woodworking career opportunities</td>
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<tr>
<td><strong>MS</strong> (A) Complete an advanced woodworking project</td>
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<tr>
<td><strong>ADVANCED PRINCIPLES OF TECHNOLOGY</strong></td>
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<tr>
<td><strong>MS</strong> Apply the principles of force as related to different systems</td>
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<tr>
<td><strong>MS</strong> Identify the principles of work as related to different systems</td>
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<tr>
<td><strong>MS</strong> Relate principles of &quot;rate&quot; to different systems</td>
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<tr>
<td><strong>MS</strong> Apply principles of resistance in different scientific systems</td>
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<tr>
<td><strong>MS</strong> Apply principles of energy used in different technological systems</td>
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<tr>
<td><strong>MS</strong> Apply the principles of power as related to different systems</td>
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<tr>
<td><strong>MS</strong> Apply the principles of power as related to different systems</td>
<td></td>
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<tr>
<td><strong>MS</strong> Apply the principles of force transformers in different systems</td>
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</tbody>
</table>
VI
Sample
Skills Card
Sample Skills Card

This section of the guide provides teachers with an example format of an instrument for evaluating the effectiveness of instruction. The skills record allows teachers to assess competency at four levels of proficiency. Teachers are encouraged to construct their own skills performance record using the competency lists in the curriculum section of this guide.

Instructions for Use

The list of vocational skills/traits was developed from a task analysis of an industrial education competency.

LEVEL CODE KEY:

1 Introductory Level: Can do simple parts of task. Needs to be told/shown how to do most of the task. Needs extremely close supervision.

2 Minimum Level: Can do most parts of the task. Needs help only with most difficult parts. Needs close supervision.

3 Average Level: Can do all parts of task. Needs only spot-check of completed work. Meets local demands for speed and accuracy. Needs moderate job entry supervision.

4 Proficiency Level: Can complete task quickly and accurately. Can direct others in how to do the task. Needs little supervision.

DIRECTIONS: The instructor/employer may write, date and initial in appropriate square.

Service electronic devices

- Practice electronic soldering techniques
- Construct a PC board
- Locate component malfunctions
- Mount system in/on physical support
- Record meter readings
- Splice wires
- Solder/unsolder components
- Perform quality control checks

COMMENTS:
Suggested Resources

This section identifies specific resources and sources for finding instructional materials and supplies for industrial education.

The following source lists have been characterized by media type to facilitate teacher use: resource libraries, publishers of texts and instructional materials, state resources, associations, periodicals, special books and pamphlets, multi-media and materials suppliers.

The Alaska Department of Education has not formally reviewed nor approved all the resources listed in this section. Teachers are encouraged to preview materials before using them in the classroom.
Resource Libraries

Alaska Vocational Materials Library
Office of Adult & Vocational Education
Alaska State Department of Education
Box F
Juneau, AK 99811
(907) 465-2980

- Alaska Energy Education Series
- Appropriate Technology for Alaskans
- Basic Skills For The Trades
- Building in the North
- Choices & Challenges: A Young Man's and Teen Woman's Journal for Self-Awareness and Personal Planning
- Cooperative Education and On-The-Job Training Handbook
- Energy Conservation in Construction Trades
- Go For It! Women Working in Construction-Related Trades in Alaska
- Home Energy Conservation Techniques (Videos)
- Introduction to Marine Technology
- Local Advisory Committee: Handbook for Vocational Administrators
- Pre-Employment Competencies Resource Guide
- Sled Construction
- The How Book on Dog Sled Construction & Equipment
- Uluaq Construction
- Alaska's Seas and Coasts
- Commercial Fishing Methods
- Mechanization of Small Fishing Craft
- Mending of Fishing Nets
- Safety and School Shop Planning
- STARS: Secondary Training For Alaska

The Library maintains curricula for all vocational areas. Resources are loaned for a 2 month review period. There are also many materials which may be purchased from the Library's special collections. Some materials are available free of charge.

The Library's catalog is computerized and may be operated on an Apple Computer using Appleworks Software. The catalog may be obtained by sending $10.00 (please make your check payable to the South East Regional Resource Center) or by sending five blank disks for duplication.

Alaska Career Information System
Office of Adult and Vocational Education
Alaska Department of Education
Box F
Juneau, AK 99811
(907) 465-2980

- Comprehensive career guidance system developed by Alaskans and for Alaskans seeking occupational and educational opportunities in and out of Alaska.

Alaska Health Sciences Library
3211 Providence Drive
Anchorage, AK
(907) 786-1870

- Journals and magazines in the area of job safety and health
Northwestern Vocational Curriculum
Coordination Center
St. Martin's College
Lacey, WA 98503

National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, OH 43210

Publishers

American Technical Publishers, Inc.
12235 South Laramie Ave.
Alsip, IL 60658

Bennett & McKnight
A Division of Glencoe Publishing Co.
17337 Ventura Blvd.
Encino, CA 91316

Dancraft
Daniel International Corporation
301 North Main Street
Greenville, SC 29601

Delmar Publishers, Inc.
2 Computer Drive West
Albany, NY 12212

Goodheart-Wilcox, Inc.
123 W. Taft Drive
South Holland, IL 60473

Hobart School of Welding Technology
Trade Square East
Troy, OH 48373

Industrial Press, Inc.
200 Madison Avenue
New York, NY 10016

Ken-Cook Educational Systems
Worldwide
12855 W. Silver Spring Drive
P.O. Box 207
Butler, WI 53007

McGraw-Hill Book Co./Gregg Division
Western Regional Office
8171 Redwood Highway
Novato, CA 94947

National Textbook Company
4255 W. Touhy Avenue
Lincolnwood, IL 60646

Prakken Publications, Inc.
P.O. Box 8623
Ann Arbor, MI 48107

South Western Publishing Co.
5101 Madison Road
Cincinnati, OH 45227

Technical Training Aids
Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

10-State regional library of vocational materials. Can be accessed through the Alaska Vocational Materials Library.

Vocational Education Curriculum Materials database of all 50 states. Can be accessed through the Alaska Vocational Materials Library.

Catalog of materials available on new technology in vocational-technical education.
State Resources

Alaska Department of Environmental Conservation
P.O. Box 0
Juneau, AK 99811

- Provides information on the handling, transportation and disposal of hazardous waste materials.

Alaska Department of Labor Occupational Safety and Health Section
3301 Eagle Street
P.O. Box 7-022
Anchorage, AK 99501

- Provides free information, training and inspections.

Alaska Department of Natural Resources Division of Mining
555 Cordova Street, Olympic Bldg.
Box 7-016
Anchorage, AK 99510

- Manages mining industry in Alaska.

Curriculum Publications Clearinghouse
Western Illinois University
Horrabin Hall Y6
Macomb, IL 61455

- Competency-Based Pre-Service Construction Trades Curriculum
- Industrial Technology Curriculum Guides (Communication, Energy Utilization, Production & Transportation)
- Machine Shop Fundamentals
- Microcomputer Applications in Vocational Education: Trades & Industry
- Vocational-Technical Education Consortium of States (V-TECS). Catalogs of performance objectives & curriculum guides for technical trade & industrial education occupations

Curriculum and Instructional Materials Center (CIMC)
Oklahoma State Department of Vocational & Technical Education
1500 West Seventh Avenue
Stillwater, OK 74074

- Auto Body
- Auto Mechanics I & II
- General Construction Trades
- Highway Maintenance Equipment Operator
- Industrial Electricity and Electronics
- Machine Shop
- Millwright
Curriculum Development Unit
Office of Vocational Education
2024 Capital Plaza Tower
Frankfort, KY 40601

East Central Curriculum Management Center
Illinois Office of Education
100 North 1st Street E. A-26
Springfield, IL 62777

Instructional Materials Laboratory
10 Industrial Education Bldg.
University of Missouri-Columbia
Columbia, MO 65211

Michigan Vocational Education Resource Center
133 Erickson Hall
Michigan State University
East Lansing, MI 48824

Mid-America Vocational Curriculum Consortium (MAVCC)
1500 West Seventh Ave.
Stillwater, OK 74074

Minnesota Curriculum Services Center
3554 White Bear Avenue
White Bear Lake, MN 55110

Occupational Curriculum Laboratory
East Texas State University
Mayo Hall, Room 213
Commerce, TX 75428

Competency-Based Materials for Industrial Education

Performance Analysis for Building Maintenance Occupations

Instructional Materials for Industrial Education

Trades & Industry Resource Materials

Air Conditioning & Refrigeration Series
- Basic Drafting Book I & II
- Basic Electronics Book I & II
- Chain Saw Repair
- Diesel Mechanics Series
- Graphic Arts Books I,II & III
- Introduction to Welding
- Outdoor Power Equipment Repair
- Residential Solar Systems
- Sheet Metal Series
- Small Engine Repair
- Snowmobile Repair

Heating and Air Conditioning
- Machine Shop Operations
- Mechanical Trades (Residential) and Welding Occupations Terminal Performance Objectives

Building Maintenance
- General Construction Trades I,II
- General Mechanical Repair
- General Metal Trades I-IV
- Small Engine Repair
Ohio Instructional Materials Laboratory
The Ohio State University
154 W. 12th Ave. Room 139
Columbus, OH 43210

Oregon Career Development Consortium
Marion Education Service District
651 High Street NE Suite 4
Salem, OR 97301

Portland State University
Division of Continuing Education
P.O. Box 1491
Portland, OR 97207

University of Alaska, Fairbanks
Alaska Sea Grant College Program
Attorney's Plaza Suite 1A
Fairbanks, AK 99775

University of Alaska, Fairbanks
School of Mineral Engineering
Brooks Building Room 209
Fairbanks, AK 99701

University of Alaska, Fairbanks
Mineral Industry Research Laboratory
210 O'Neil Resources Building
Fairbanks, AK 99701

University of Texas at Austin
P.O. Box 7218
Austin, TX 78713

Utah State Office for Vocational Education
250 East 500 South
Salt Lake City, UT 84111

Vocational Studies Center
University of Wisconsin - Madison
964 Educational Sciences Bldg.
1025 West Johnson Street
Madison, WI 53706

- Custodial Training Learner's Manual
- Machine Trades I, II, III
- Shop Safety

- Basic Skills in Vocational Education: Computer Skills, Mathematics, Reading, Speaking/Listening, and Writing

- Individualized Learning Systems for Auto Body and Fender, Auto Mechanics, Construction, Drafting, Electrical, Electronics, Hydraulics, Industrial Mechanics, Metals, and Welding

- Alaska Sea/River Week Curriculum Guides

- Provides reports and information on mining and offers assistance to miners.

- Conducts studies and research on development and use of Alaska's minerals and coal resources.

- Bricklayer and Stonemason
- Building Maintenance Repairer
- Cabinetmaker
- Carpentry I & II
- Construction Technology
- Woodworking Technology

- Computer-Aided Manufacturing
- Computer, Laser, Photovoltaic, Robotic, and Satellite Technology curriculum guides

- Tools, Equipment & Machinery: Adapted for Vocational Education and the Employment of Handicapped People
- Urban Soil and Water Management
Associations

Alaska Loggers Association
111 Steadman Suite 200
Ketchikan, AK 99901

Information on forestry and timber industry.

Alaska Miners Association, Inc.
Statewide Office
509 West 3rd Avenue Suite 17
Anchorage, AK 99501

Information on mining in Alaska.

Alaska Oil and Gas Association
505 W. Northern Lights Blvd Suite 219
Anchorage, AK 99503

Alaska Oil and Gas Industry Facts
The Alaska Oil and Gas Story

American Association for Vocational Instructional Materials (AAVIM)
120 Driftmeir Engineering Center
Athens, GA 30602

Arc Welding
Assisting Students in Improving their Basic Skills
ATV Maintenance Manual
Building Materials Costs
(Computer Software)
Concrete and Concrete Masonry
Construction: Basic Principles
Developing Shop Safety
Drywall
Electric Motors
Electrical Wiring
How to Paint Your House
Inboard/Outboard Service Manual
Maintaining the Lighting & Wiring System
Masonry Simplified
Measurement & Layout Tools
(Computer Software)
Metals & Welding
Plumbing Installation and Design
Power Tool Safety Operation
Rafter Layout in the Framing Square for School and Home Workshop
Shop Planning
Small Engines I & II
Snowmobile Service Manual
Understanding & Measuring Power
Understanding Electricity & Electrical Terms
Welding Skills
American Petroleum Institute
1220 L Street NW
Washington, D.C. 20005

American Technical Society
12235 So. Laramie Ave.
Alsip, IL  60658

American Vocational Association (AVA)
1410 King Street
Alexandria, VA  22314

Artists and Blacksmiths Association of
North America
P.O. Box 303
Cedarburg, WI 53012

Associated Builders & Contractors
729 15th Street N.W.
Washington, DC  20005

Associated General Contractors of America
1957 E. Street N.W.
Washington, DC  20006

Instrument Society of America
67 Alexander Drive
P.O. Box 12277
Research Triangle Park, NC 27709

International Association of Plumbing
& Mechanical Officials
IAPMO Hqds
5032 Alhambra Avenue
Los Angeles, CA  90032

- Black Gold on the Kenai
- Facts About Oil
- Fish and Offshore Oil Development
- Oil and Gas and the Challenge of the Arctic
- Petroleum Exploration: Continuing Need

- Machine Shop Operations and Set Ups


- The Anvil's Ring

- Wheels of Learning Instructional Materials

- Bricklaying
- Commercial & Residential
- Carpentry Series
- Cement Masonry
- Construction Craftsman
- Manual of Accident Prevention in Construction
- Millwright
- Heavy Equipment Mechanic Series
- Heavy Equipment Operator Series

- Publications & Training Aids Catalog

- Uniform Plumbing Code
Information on colleges and universities offering forestry degrees.

Opportunities Unlimited in Forestry

Provides technical information, assistance and publications on job safety and health.

Concepts and Techniques of Machine Safeguarding

High Technology Materials

Carpentry Apprentice Training Course

Carpenter Magazine

Advisor Guide/Integrating VICA into the Trades & Industrial Program

National Leadership Handbook

The Technology Teacher

Constructor Magazine

Industrial Education

Periodicals
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<tr>
<th>Company</th>
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<tr>
<td>Energy Publications, Inc.</td>
<td>P.O. Box 2008</td>
<td>WoodHeat</td>
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<tr>
<td>John A. Linkletter</td>
<td>327 W. 57th Street</td>
<td>Popular Mechanics</td>
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<tr>
<td>Martin Fox R.C. Publications, Inc.</td>
<td>355 Lexington Ave.</td>
<td>Print</td>
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<tr>
<td>National Association of Home Builders</td>
<td>15th and M Streets NW</td>
<td>The NAHB Journal of Home Building</td>
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<tr>
<td>Prakken Publications</td>
<td>P.O. Box 8623</td>
<td>School Shop</td>
</tr>
<tr>
<td>Solar Vision Inc.</td>
<td>P.O. Box 8420</td>
<td>Progressive Builder: Energy Efficiency and Quality Home Construction</td>
</tr>
<tr>
<td>Taunton Press, Inc.</td>
<td>P.O. Box 355</td>
<td>Fine Homebuilding</td>
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<tr>
<td>Vernon Publications, Inc.</td>
<td>109 W. Mercer Street</td>
<td>Alaska Construction and Oil</td>
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<tr>
<td>Village Press, Inc.</td>
<td>P.O. Box 1810</td>
<td>The Home Shop Machinist</td>
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<tr>
<td>Workbench Magazine</td>
<td>4251 Pennsylvania Avenue</td>
<td>Workbench Magazine</td>
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Special Books/Pamphlets

Alaska Health Project
417 West Eighth Ave.
Anchorage, AK  99501

- Alaskan Health Hazards in the Workplace: It's Your Right to Know
- Keep This In Your Tool Box: A Health & Safety Manual for Alaska Construction Workers

Alaska Seafood Marketing Institute
526 Main Street
Juneau, AK  99801
(907) 586-2902

- Challenge for Excellence (video)
- Competitive Edge (video)
- Fresh and Frozen Salmon: How to Sell It (video)
- Handle With Care: A Retail Seafood Quality Primer
- Handle With Care: Recommended Seafood Quality Guidelines for Reprocessors and Cold Storages of Alaska Seafood
- Handle With Care: The Alaska Shipper's Guide to Seafood Quality
- Handling Fish: A Handbook for Commercial Fisheries Biologists
- Recommended Salmon Quality Guidelines for Fishing, Tendering and Processing Operations
- Recommended Whitefish Quality Guidelines for Fishing and Processing Operations
- The Seafood Quality Primer: Consumer Tips for Purchasing, Handling and Storing High Quality Seafood

Alyeska Pipeline Service Company
1835 South Bragaw Street
Anchorage, AK  99512

- Operating the Trans-Alaska Pipeline

Arctic Environmental Information and Center
707 A Street
Anchorage, AK  99501

- Provides information and data on Alaska and circumpolar arctic environments and natural resources.

Atlantic Richfield Company
515 S. Flower Street
Los Angeles, CA  90051

- Welcome to the North Slope
182

168
Ortho Books
Chevron Chemical Company
575 Market Street
San Francisco, CA 94105

. Basic & Finish Carpentry Techniques
. Basic Masonry Techniques
. Basic Plumbing Techniques
. Basic Remodeling Techniques
. Basic Wiring Techniques
. Energy Saving Projects for the Home
. How To Build and Use Greenhouses
. Ortho's Home Improvement Encyclopedia: Problem Solving from A to Z

Reader's Digest Association, Inc.
Pleasantville, NY

. Home Improvements Manual
. Reader's Digest Complete Do-It-Yourself Manual

Rodale Press, Inc.
Emmaus, PA 18049

. Low-Cost, Energy Efficient Shelter for the Owner & Builder
. Movable Insulation

R.S. Means Company, Inc.
Construction Consultants and Publishers
100 Construction Plaza
P.O. Box 800
Kingston, MA 02364

. Means Illustrated Construction Dictionary

SOHIO
A Company of Standard Oil
101 Prospect Avenue
Cleveland, OH 44115

. Prudhoe Bay and Beyond

Sunset Books
Lane Publishing Company
Menlo Park, CA 94025

. Basic Carpentry
. Basic Home Repairs
. Basic Home Wiring
. Basic Masonry
. Do-It-Yourself Energy Savings Projects
. Insulation and Weatherstripping
. Solar Heating & Cooling

Ten Speed Press
PO Box 7123
Berkeley, CA 94704

. Before You Build: A Pre-Construction Guide
. The Complete Wood-Worker
U.S. Forest Service
Alaska Region
Federal Office Building
P.O. Box 1628
Juneau, AK 99802

U.S. Geological Survey
Public Inquiries Office
4230 University Drive Room 101
Anchorage, AK 99508

Multi-Media Materials

Autodesk, Inc.
2320 Marinship Way
Sausalito, CA 94965

Career Aids, Inc.
20417 Nordhoff Street, Dept SWB
Chatsworth, CA 91311

Dana Corporation
School Assistance
Box 453
Toledo, OH 43692

DCA Educational Products, Inc.
4685 Stenton Ave
Philadelphia, PA 19144

Alaska Commercial Tree Species
Alaska: Minerals to Match the Mountains
Alaska Solitude: Wilderness Areas of the Tongass National Forest
Enhancing A Great Resource: Anadromous Fish Habitat
Investigating Your Environment: Teaching Materials for Environmental Education
Land at River's End: The Copper River Delta
New Industries in Alaska's National Forests: Planting, Thinning, Release and Weeding
Recreational Mining: Chugach National Forest
Reference Guide for Environmental Education and Conservation of Natural Resources
Timber Management
Wildlife Perspective: The Next 100 Years of Forestry in Alaska
Woodsy Owl Environmental Education Teacher's Kit

Information and publications on physical resources of Alaska.
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<th>Company Name</th>
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<th>City, State, Zip</th>
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<tr>
<td>Meridian Educational Corp.</td>
<td>Library Filmstrip Center</td>
<td>Bloomington, IL 61701</td>
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<tr>
<td>National Archives &amp; Records Administration</td>
<td>National Audiovisual Center</td>
<td>Capitol Heights, MD 20743</td>
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<tr>
<td>National Innovative Media Co.</td>
<td>Route #2, Box 301 B</td>
<td>Calhoun, KY 42327</td>
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<tr>
<td>Pictures, Inc.</td>
<td>811 W. 8th Ave.</td>
<td>Anchorage, AK 99501</td>
</tr>
<tr>
<td>Sargent Welch Scientific Company</td>
<td>7300 North Linder Avenue</td>
<td>Skokie, IL 60077</td>
</tr>
<tr>
<td>Materials Suppliers</td>
<td></td>
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</tr>
<tr>
<td>Advance Proces. Supply Co.</td>
<td>400 N. Noble Street</td>
<td>Chicago, IL 60622</td>
</tr>
<tr>
<td>Allied Electronics</td>
<td>401 E. 8th St.</td>
<td>Fort Worth, TX 76102</td>
</tr>
<tr>
<td>Broadhead-Garrett Co. Western Division</td>
<td>161 Commerce Circle</td>
<td>Sacramento, CA 95852</td>
</tr>
<tr>
<td>Buckner-Weatherby Company, Inc.</td>
<td>5931 Fourth Ave. South</td>
<td>Seattle, WA 98108</td>
</tr>
<tr>
<td>Delvies Plastics, Inc.</td>
<td>P.O. Box 1415</td>
<td>Salt Lake City, UT 84110</td>
</tr>
<tr>
<td>Teaching Aids, Inc.</td>
<td>P.O. Box 1798</td>
<td>Costa Mesa, CA 92626</td>
</tr>
<tr>
<td>The Media Center</td>
<td>State Fair Community College</td>
<td>Sedalia, MO 65301</td>
</tr>
<tr>
<td>Vocational Media Associates Prentice-Hall Media</td>
<td>P.O. Box 1050</td>
<td>Mount Kisco, NY 10549</td>
</tr>
<tr>
<td>VTR-Industrial Training</td>
<td>VTR Video Training Resources, Inc.</td>
<td>7500 West 78 Street Edina, MN 55435</td>
</tr>
<tr>
<td>Enco Manufacturing Co.</td>
<td>5000 W. Bloomingdale</td>
<td>Chicago, IL 60639</td>
</tr>
<tr>
<td>Industrial Arts Supply Co.</td>
<td>5724 West 36th Street</td>
<td>St. Louis Park, MN 55416</td>
</tr>
<tr>
<td>John Deere and Company Distribution Service Center, Dept 150</td>
<td>1400 3rd Avenue</td>
<td>Moline, IL 61265</td>
</tr>
<tr>
<td>Midwest Shop Supplies, Inc.</td>
<td>2600 Bridgeport</td>
<td>Sioux City, IA 51102</td>
</tr>
<tr>
<td>Modern School Supplies, Inc.</td>
<td>P.O. Box 958</td>
<td>Hartford, CT 06143</td>
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</table>
Northern Hydraulics, Inc
P.O. Box 1499
Burnsville, MN 55337

SATCO, Division of Saterlee
924 South 19th Ave.
Minneapolis, MN 55404

Sears, Roebuck & Co.
Sears Tower
Chicago, IL 60684

Snap-On-Tools Corp.
2801 80th Street
Kenosha, WI 53204

T & W Systems
7372 Prince Drive
Huntington Beach, CA 92647