



# *Course of Study*

## *Heating, Ventilation, and Air Conditioning*

**Upper Valley JVS District**

**8811 Career Drive  
Piqua, Ohio 45356**

**Revised June 2005**

**Adopted**

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## *Acknowledgements*

### **Heating, Ventilation, and Air Conditioning Program Upper Valley JVS District**

We would like to take this opportunity to express our gratitude to the following people for their guidance and support in the preparation of this course of study:

Mr. Karl Wilson, Superintendent, Upper Valley JVS  
Mr. Mike Shellabarger, Director, Upper Valley JVS  
Mr. Gene Cordonnier, Curriculum Committee Chairman  
Curriculum Committee Members: Marilyn Mitchell, Julie Roeth  
Terry Krogman, Supervisor

Sincerely,

Scott Nail Staff

***Upper Valley JVS District  
Resolution of School Board Approval***

WHEREAS, representatives of the HVAC/R Career-Technical Advisory Committee of the Upper Valley JVS District have reviewed the HVAC/R Course of Study; and

WHEREAS, this Course of Study is based upon Integrating Technical and Academic Competencies for Career-Focused Education for the HVAC/R program; and

WHEREAS, the HVAC/R staff has reviewed and added competencies as needed to address local labor market needs, and to acknowledge the school district's ability to offer specialized programs;

NOW, THEREFORE, BE IT RESOLVED, in accordance with the Superintendent's recommendation, that the Upper Valley JVS District adopt the HVAC/R Course of Study.

Approval Date:

\_\_\_\_\_  
District Superintendent

\_\_\_\_\_  
Board President

## *Career-Technical Advisory Committee's Statement of Recommendation*

The HVAC/R Career-Technical Advisory Committee at Upper Valley JVS District has reviewed this course of study and recommends it for use as the foundation for instruction in HVAC/R class.

The developers of the course of study have considered local labor market needs and the school district's ability to offer specialized programs. The competencies have been reviewed and accepted as being congruent with our school district's vision, mission, and strategic goals and student outcome measures. Additional competencies related to the program area have been incorporated into the course of study.

We believe that this course of study adequately and correctly focuses upon the development of technical competencies, attitudes, values, and appreciation critical to successful employment in the field.

This course of study is recommended on: June 2005

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Sherman Lewis

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Business, industry, or labor member

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Business, industry, or labor member

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Business, industry, or labor member

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Business, industry, or labor member

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Business, industry, or labor member

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Business, industry, or labor member

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Administrator

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Community Member

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Parent/Guardian

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Student

## ***Upper Valley JVS Vision***

The Upper Valley JVS will be a center for excellence in career and technical education, preparing students for success in a global society.

## ***Upper Valley JVS Mission Statement***

The Upper Valley JVS is dedicated to providing the highest quality and most technologically advanced educational opportunities for students in a professional, caring environment while networking with the communities we serve.

## ***Upper Valley JVS Strategic Goals***

1. Develop a comprehensive system of innovative career and technical education offerings
2. Provide educational support services which meet the individual needs of each student
3. Provide technologically advanced facilities and equipment for students and staff
4. Provide a safe and supportive school environment
5. Maintain fiscal responsibility
6. Attract and maintain well-qualified staff
7. Promote teamwork as the organizational structure for continuous quality improvement
8. Enhance communication with all stakeholders

## ***Program Design***

Programs are designed to reflect career-focused education, which combines high-level academics with real-life technical skills. The intent is to maximize a student's present and future academic and career success.

Career-focused education enhances the integration of academic and technical skills, designs programs that prepare students with transferable skills and promotes each student's career opportunities.

## ***Program Philosophy Upper Valley JVS***

We believe that in providing the highest quality and most technologically advanced skill training, for the Upper Valley JVS Heating, Ventilation, and Air Conditioning/Refrigeration program. This program is expected to meet or exceed industry and school standards.

## ***Program Goals***

The program goals for HVAC/R Program are to:

Achievement standards

Positive post-program placement

All students pass Ohio Competency Analysis Profile (OCAP) assessment results

Diploma attainment rate

Student and Staff attendance 95% or Better

## *Program Description*

Few phases of modern living are untouched by today's HVAC/R industry. Skilled specialist design, install and maintain controlled environments in enclosed areas ranging from homes to space satellites. Students develop Heating, Ventilation and Air Conditioning skills through actual work experience in a spacious lab setting with up-to-date equipment.

HVAC/R graduates are skilled specialist that create, install and maintain healthy comfortable environments for people in their homes, automobiles, factories, office buildings, schools, sports arenas, and almost any structure where people live, work or play.

The Upper Valley JVS HVAC/R Program is committed to prepare students to succeed in the workplace.

### Career Opportunities

Entry level Positions include:

- Laborer
- Heating and Air Conditioning/ Refrigeration technician
- Plumber
- Sheetmetal worker
- Installer

Advanced Opportunities:

- Project Manager
- Chief Estimator
- Business Owner

## ***Overview of Program Operation Academic and Technical Connection***

Expectations (Academic Content Standards, OCAPs, ITACs, and state or national standards) must be aligned with what is written (Board of Education adopted courses of study), with what is taught (lesson plans and instructional strategies), with what is tested (Ohio Graduation Tests, hi-stakes tests, formative and summative tests and other tests), and with what is reported (indicators of success and vocational education planning district performance measures). All VEPDs with workforce development academics receiving weighted funding must have a curriculum alignment process in progress.

The HVAC/R Program technical skills will be aligned with Mathematics, Science and English through a meeting of the program instructor before and during the school year. This is where the curriculum mapping will be developed. This map will show the intended curriculum for the HVAC/R Program. Through this collaboration process Math, Science and English concepts and skill will then be aligned so that what is taught in the HVAC/R Program will relate and correspond. By doing this students can use Math skills, Science Skill and English Skills that have been presented in the academic classes directly in their class and lab assignments thus showing the students how academic course work is used on the job.

The academic courses at the Upper Valley JVS are designed to meet both associate school and state requirements. The academic courses at the Upper Valley JVS follow the state model curricula. These standards respond to the public's desire for increased accountability for schools to require competency-based education. The need to design and implement curricula that reflect important and dramatic changes in our society is clear and requires that we be responsive to educational changes. These model programs have been designed to improve student achievement, to improve the quality of curriculum and instruction, and to strengthen school and community relationships through better communication.

## ***Continuous Quality Improvement***

Upper Valley JVS is committed to developing quality initiatives. The HVAC/R program is dedicated to improving the lives of students, staff, and the community we serve through quality improvement measures. These are implemented through performance and process.

Non-traditional enrollment  
Career Passport rate

## ***Field Experiences and Early Placement***

Our apprenticeship program is a way for the student to jump start into a formal, federally registered apprenticeship program. A local employer will sponsor students while they are in high school. The qualifying student will work during the summer after their Junior year. During their senior year they will attend school two weeks and work on the job site for two weeks.

Field experience for the HVAC/R students consist of field trips to businesses that relate directly to the intended philosophy and goals of the program. The field trips present to the students types of employment available to them in the HVAC/R field. Field trips also show employment skills, equipment techniques required to be employed in this field.

Another experience available to the student is job shadowing/ mentoring program. Students can arrange a visit to a business for a day to acquire work experience. This visit gives the student hands on experience and helps them see what the HVAC/R is all about.

Also students enrolled can earn early release work privileges by establishing a school record that meets the established criteria. Standards to be considered are grades, attendance, citizenship, and skills development. Work experiences encountered during this time will be closely coordinated between the employer and the instructor.

Level II students can also take advantage of work placement during the spring of their second year. In order to participate the student must have high academic marks, must have exceptional skills development and a recommendation of the instructor.

## ***Articulation with Post-Secondary Institutions***

Based upon a mutual concern for the needs of students pursuing post-secondary career education and in an effort to provide a continuing articulated program that builds on past learning experiences and eliminates unnecessary duplication of instruction and resources, Sinclair Community College, Northwestern College and Upper Valley JVS HVAC/R Program have developed partnership agreements to save the students money and valuable time which allows them to earn college credit. This articulation agreement offers students who earn an A or B average the chance to earn up to twelve advanced-standing college credits. This opportunity offers a student a chance to pursue an Associates Degree in Mechanical Engineering should they so choose.

## *Technology*

The HVAC/R Program incorporates the latest technology into the program through direct contact with advisory committee members and local employers. Through donations of equipment and valuable time employers assist the instructor and students with the latest technology advances. Along with partnerships with Copeland Corporation and Carrier Corporation the HVAC/R is preparing students with up-to-date equipment used in industry today.

## *Career-Technical Student Organizations*

Career-Technical Student Organizations are national organizations and are part of the curriculum in each of the JVS programs. Participation provides students with the opportunity to develop leadership skills, grow personally and professionally, and develop civic responsibilities and career-related competencies. Students have the opportunity to enhance their social awareness and to develop and enhance their understanding of business and industry.

Career-Technical Student Organization activities encourage members to learn:

- o to conduct and take part in public meetings

- o to buy and sell cooperatively

- o to speak in public

- o to solve their own problems

- o to assume civic responsibilities.

Each JVS program is involved in a Career-Technical Student Organization. These organizations provide leadership training for all members through organized activities and also unite to form an Upper Valley JVS chapter for each of the Career-Technical Student Organizations. The chapters unify the training of members by offering local, regional, state, and national skill and leadership competitions.

Participation in the local Career -Technical Organization (SkillsUSA) is an essential part of the HVAC/R Program and is included in the curriculum. Students are highly encouraged to participate in the SkillsUSA organization in both school and out of school experiences. The goal of SkillsUSA is for the students to develop leadership, citizenship and communication skills. SkillsUSA provides opportunities for each student to participate in meetings and leadership activities provided at local, state and national levels.

## ***Population Served***

The population served by this program is all students who have met home school and Upper Valley JVS enrollment requirements with interest and ability to profit from the HVAC/R Program may enroll. Educationally, economically, and/or physically disadvantaged students are mainstreamed unless disability prevents a student from benefiting from the program or creates a significant safety hazard to self or others. Students for which this program would be considered nontraditional are encouraged to enroll.

## ***Career Opportunities***

Entry level positions include:

- Residential installer
- Commercial installer
- Service technician
- Refrigeration installer
- Refrigeration Technician
- Plumber

Advanced employment opportunities include:

- Industrial Installer
- Foremen
- Estimator
- Business owner
- Manager

# *Scope and Sequence*

## *Integrated Core ITACs*

- 1.1 Solve problems and make decisions in work-related situations
- 1.2 Read for information and understanding
- 1.3 Use observations skills to analyze work-related situations
- 1.4 Apply mathematical processes
- 1.5 Apply measurement and spatial skills
- 1.6 Apply statistical analysis skills
- 1.7 Analyze critical data to guide work activities
- 1.8 Utilize scheduling techniques to ensure that jobs are completed by the stated due date
- 1.9 Demonstrate knowledge of the economy and how it functions as a whole
- 1.10 Demonstrate knowledge of the economy as a framework within which decisions are made by individuals and groups
  
- 2.1 Apply basic communication skills
- 2.2 Apply oral communication skills
- 2.3 Apply written communication skills
- 2.4 Apply technical writing skills
- 2.5 Apply listening skills
- 2.6 Apply demonstration /presentation skills
- 2.7 Apply graphic communications skills
- 2.8 Apply artistic communication skills
- 2.9 Convey information through multimedia presentations
- 2.10 Create graphs and charts
- 2.11 Build interpersonal relationships.
  
- 3.1 Demonstrate technological literacy
- 3.2 Access/transmit information using electronic communication systems
- 3.3 Demonstrate computer literacy
- 3.4 Use database software in work-related situations
- 3.5 Use spreadsheet software in work-related situations
- 3.6 Use word-processing software in work-related situation
  
- 4.1 Demonstrate leadership
- 4.2 Contribute to teamwork
- 4.3 Choose ethical courses of action in all work assignments and personal interactions
- 4.4 Demonstrate the work ethics
- 4.5 Comply with the confidentiality requirements of workplace policies and procedures
- 4.6 Apply appropriate strategies for dealing with the differences associated with diversity (e.g., racial, ethnic, gender, educational, personality, social, and age)
  
- 5.1 Identify how personal interests, abilities, and skills relate to choosing a career
- 5.2 Investigate career options

- 5.3 Chart career using career-planning skills
- 5.4 Demonstrate skills needed to enter or reenter the workforce
- 5.5 Demonstrate job-keeping skills
- 5.6 Upgrade career skills
- 5.7 Explore opportunities to create business
  
- 6.1 Apply self-management processes in the workplace
- 6.2 Use reference materials to obtain information appropriate to a given problem, topic, or situation
- 6.3 Maintain/promote wellness
- 6.4 Determine the impact of government regulations and business/industry procedures on the performance of particular work functions
- 6.5 Implement safety procedures and programs
- 6.6 Support the provision of first aid in accordance with company policy and procedures
- 6.7 Manage work and family responsibilities for the well-being of self and others
- 6.8 Determine resources needed to produce a given product or provide a given service
- 6.9 Ensure the quality of products and services
- 6.10 Utilize an inventory control system to track supplies, materials, and equipment
- 6.11 Make informed financial decisions

## *Career Cluster ITACs*

### **Unit 1: Workplace Safety**

**Competency 1.1: Use personal safety equipment according to Occupational Safety and Health Administration (OSHA) regulations.**

**Competency Builders:**

- 1.1.1 Define OSHA.
- 1.1.2 Identify personal protective equipment.
- 1.1.3 Understand and apply personal protective equipment.
- 1.1.4 Demonstrate basic first-aid techniques.
- 1.1.5 Describe the ramifications of non-compliance and consequences to the employee and employer.
- 1.1.6 Define workman's compensation.

**Competency 1.2: Understand general safety procedures according to OSHA.**

**Competency Builders:**

- 1.2.1 Use appropriate fire extinguishers.
- 1.2.2 Use power disconnect switches and lockout/tag out procedures.
- 1.2.3 Apply safety procedures to the use of equipment.
- 1.2.4 Identify potential safety hazards.

**Competency 1.3: Identify, handle, use, and dispose of hazardous materials.**

**Competency Builders:**

- 1.3.1 Read and follow container label precautions.
- 1.3.2 Locate, read and follow Material Safety Data Sheet (MSDS) for hazardous material.
- 1.3.3 Store and dispose of hazardous materials according to Environmental Protection Agency (EPA), OSHA or site specifications.

**Competency 1.4: Use, handle and store tools, materials and equipment according to manufacturer guidelines.**

**Competency Builders:**

- 1.4.1 Identify potential hazards of hand tools, power tools and equipment.
- 1.4.2 Demonstrate safe use and proper maintenance of hand tools, power tools and equipment.
- 1.4.3 Demonstrate proper handling and lifting methods.

**Unit 2: Basic Electricity**

**Competency 2.1: Analyze and measure electrical values.**

**Competency Builders:**

- 2.1.1 Understand the basics of magnetism.
- 2.1.2 Apply magnetic principles to electrical theory.
- 2.1.3 Identify conducting and insulating materials.
- 2.1.4 Measure resistance values.
- 2.1.5 Apply Ohm's law.
- 2.1.6 Construct and analyze basic Alternating Current (AC) circuits.
- 2.1.7 Identify and troubleshoot basic electrical/electromechanical and solid state controls.
- 2.1.8 Measure current, voltage, and resistance in AC circuits.

**Competency 2.2: Use electrical test equipment.**

**Competency Builders:**

- 2.2.1 Select appropriate test equipment for application.
- 2.2.2 Demonstrate proper use of ammeter, ohmmeter, voltmeter, wattmeter and megger or multimeter.
- 2.2.3 Compare Peak (PK) – need to spell this out on first reference, what is this?), Root Mean Square (RMS) and average values.

**Unit 3: Single-Phase, Split-Phase and Three-Phase Circuits and Devices**

**Competency 3.1: Demonstrate knowledge of single-phase and split-phase motors.**

**Competency Builders:**

- 3.1.1 Identify various types of single-phase and split-phase motors.
- 3.1.2 Understand motor starting components and sequencing.
- 3.1.3 Understand motor protection.
- 3.1.4 Troubleshoot single-phase and split-phase motors and starting systems.
- 3.1.5 Interpret motor nameplate information and motor specifications (i.e. National Electrical Manufacturers Association (NEMA) – needs spelled out on first reference).

**Competency 3.2: Demonstrate knowledge of three-phase motors.**

**Competency Builders:**

- 3.2.1 Identify various types of three-phase motors.
- 3.2.2 Troubleshoot three-phase motors.
- 3.2.3 Interpret motor nameplate information and motor specifications (i.e. NEMA).
- 3.2.4 Discuss phase protection.

**Competency 3.3: Demonstrate knowledge of motor control devices.**

**Competency Builders:**

- 3.3.1 Identify various types of motor assisting devices.
- 3.3.2 Apply the use of motor assisting devices (i.e. contactors, starters, variable frequency and motor speed controls).

**Competency 3.4: Demonstrate knowledge of motor operation and application.**

**Competency Builders:**

- 3.4.1 Wire single-phase and three-phase motors and motor control devices.
- 3.4.2 Verify motor rotation and operation.
- 3.4.3 Interpret schematics and control diagrams.
- 3.4.4 Identify motor loads.

**Unit 4: Fundamental concepts of refrigeration**

**Competency 4.1: Understand Physical Laws as Applied to Refrigeration.**

**Competency Builders:**

- 4.1.1 Record and compare temperature and pressure measurements.
- 4.1.2 Analyze and interpolate temperature and pressure relationships.
- 4.1.3 Explain heat and heat transfer.
- 4.1.4 Explain energy and energy conversion.
- 4.1.5 Differentiate sensible, latent and total heat.

**Competency 4.2: Analyze mechanical refrigeration cycle and components.**

**Competency Builders:**

- 4.2.1 Discuss principles of thermodynamics.
- 4.2.2 Compare and contrast and function of evaporators, condensers, compressors and metering devices
- 4.2.3 Compare various refrigerants and their characteristics.

**Competency 4.3: Explain the refrigeration cycle and its components.**

**Competency Builders:**

- 4.3.1 Define superheat and subcooling.
- 4.3.2 Interpret and compare temperature pressure chart relationships.
- 4.3.3 Calculate and record saturation temperature of refrigerant
- 4.3.4 Calculate and record superheat and subcooling.

**Unit 5: Basic Piping and Tubing Skills**

**Competency 5.1: Identify and perform soldering and brazing procedures.**

**Competency Builders:**

- 5.1.1 Review state codes related to pressure piping.
- 5.1.2 Identify different soldering and brazing materials.
- 5.1.3 Join materials with low-temperature solder.
- 5.1.4 Join materials with high temperature brazing.
- 5.1.5 Join ferrous and non-ferrous metals.

**Competency 5.2: Demonstrate proper use of piping material, fabrication and application.**

**Competency Builders:**

- 5.2.1 Identify different types of piping and tubing.
- 5.2.2 Demonstrate proper bending and connecting tubing and piping techniques.
- 5.2.3 Demonstrate proper fabrication of tubing and piping.
- 5.2.4 Identify and use proper tubing and piping fittings.

**Competency 5.3: Perform leak-detection procedures.**

**Competency Builders:**

- 5.3.1 Apply soap bubble technique.
- 5.3.2 Apply inert gas technique.
- 5.3.3 Apply electronic test.
- 5.3.4 Apply fluorescent dye technique.

## **Unit 6: Basic Tools and Equipment**

**Competency 6.1: Demonstrate use of common hand tools.**

**Competency Builders:**

- 6.1.1 Identify and select proper hand tools.
- 6.1.2 Use and maintain hand tools (wrenches, crimpers, cutters, pliers, and pullers, etc.) properly.

**Competency 6.2: Demonstrate use of power tools.**

**Competency Builders:**

- 6.2.1 Identify and select proper power tools.
- 6.2.2 Use and maintain power tools (drills, saws, etc.) properly.

**Competency 6.3: Demonstrate use of specialized Heating, Ventilation and Air Conditioning/Refrigeration (HVAC/R) test equipment and tools.**

**Competency Builders:**

- 6.31. Use refrigerant recovery equipment.

- 6.3.2 Use digital charging scale.
- 6.3.3 Use vacuum pump and micron gauge/scale.
- 6.3.4. Use thermometer/thermocouple.
- 6.3.5 Use fin comb.
- 6.3.6 Use heat gun.
- 6.3.7 Use piercing valves.
- 6.3.8 Use sling psychrometer.
- 6.3.9 Use a manometer.
- 6.3.10 use air analyzing measuring instruments.
- 6.3.11 Use a combustion analyzer/Carbon Monoxide meter.

## **Unit 7: Refrigeration and Air-Conditioning Equipment**

**Competency 7.1: Install refrigeration and air-conditioning equipment.**

**Competency Builders:**

- 7.1.1 Install window air conditioner.
- 7.1.2 Install central air conditioner and heat pump.
- 7.1.3 Install refrigeration condensing unit with remote evaporator.

**Competency 7.2: Perform Service Maintenance (SM) on related HVAC equipment.**

**Competency Builders:**

- 7.2.1 Perform SM on electric heating equipment.
- 7.2.2 Perform SM on air handler.
- 7.2.3 Perform SM on air filtration equipment.
- 7.2.4 Perform SM on humidifier/dehumidifier.
- 7.2.5 Perform SM on indoor and outdoor section of air conditioner or heat pump and refrigeration systems.

**Competency 7.3: Troubleshoot refrigeration and air-conditioning equipment.**

**Competency Builders:**

- 7.3.1 Connect hermetic/semi-hermetic compressor to power supply.
- 7.3.2 Check circuitry of compressor, protector, relay, capacitor and hard start kit.
- 7.3.3 Connect manifold and gauges to service valves/access fittings and check pressures.
- 7.3.4 Examine unit operation, oil level, and sight glass moisture indicator.
- 7.3.5 Analyze circuitry of refrigeration defrost.
- 7.3.6 Check and adjust refrigeration control thermostat.
- 7.3.7 Check condensate pump and drain.
- 7.3.8 Check system for burnout and identify proper procedures for cleanup.
- 7.3.9 Check and adjust water valve.
- 7.3.10 Check and adjust pressure and safety controls.
- 7.3.11 Verify proper operation of thermostatic expansion valve.
- 7.3.12 Verify CFM OK as is...spell this out here with acronym after it in parenthesis... and check temperature drips across indoor and outdoor coils.

**Competency 7.4: Service and repair refrigeration and air-conditioning equipment (Secure EPA refrigerant certification)**

**Competency Builders:**

- 7.4.1 Recover refrigerant from system.
- 7.4.2 Recharge system utilizing different methods.
- 7.4.3 Pump down the system.
- 7.4.4 Repair all leaks in system.
- 7.4.5 Isolate system components.
- 7.4.6 Match oil to refrigerants in system.
- 7.4.7 Remove and replace applicable components and accessory.

**Unit 8: Forced Air Heating Systems**

**Competency 8.1: Identify and install heating system.**

**Competency Builders:**

- 8.1.1 Fabricate and install distribution system.
- 8.1.2 Install gas (natural or propane), electric, and oil heating unit.
- 8.1.3 Utilize proper combustion, venting and ventilation tables to assure proper operations.
- 8.1.4 Install air-to-air heat pump.
- 8.1.5 Identify components of a geo-thermal system.

**Competency 8.2: Troubleshoot and service heating systems.**

**Competency Builders:**

- 8.2.1 Check power supply.
- 8.2.2 Check fuel (gas or oil) supply.
- 8.2.3 Check ignition assembly.
- 8.2.4 Check wall thermostat (heat anticipator).
- 8.2.5 Check gas train assembly.
- 8.2.6 Check and adjust incoming and gas manifold pressure.
- 8.2.7 Check electronic ignition system on gas unit.
- 8.2.8 Check and adjust blower systems using different methods.
- 8.2.9 Check and adjust fan control.
- 8.2.10 Check limit control.
- 8.2.11 Check heat exchanger.
- 8.2.12 Check oil ignition system and pump pressure.
- 8.2.13 Perform combustion analysis.
- 8.2.14 Perform ventilation air test.
- 8.2.15 Verify operation of safety circuits.
- 8.2.16 Remove and replace all applicable components.

**Unit 9: Hydronics**

**Competency 9.1: Understand fundamentals of hot water/chilled water system (hydronics).**

**Competency Builders:**

- 9.1.1 Identify basic system components.
- 9.1.2 Identify basic system designs.
- 9.1.3 Review state codes related to boilers and piping.

**Competency 9.2: Understand the application, selection and installation of system components.**

**Competency Builders:**

- 9.2.1 Observe and test the operation of a hydronics system.
- 9.2.2 Identify components of a hydronics system.
- 9.2.3 Select major components of a hydronics system.
- 9.2.4 Review/test safety controls.

**Unit 10: Low Pressure Steam Heating**

**Competency 10.1: Identify types of steam systems.**

**Competency Builders:**

- 10.1.1 Identify basic system components.
- 10.1.2 Identify basic system designs.
- 10.1.3 Review state codes related to boilers and piping.

**Competency 10.2: Understand the application, selection and installation of system components.**

**Competency Builders:**

- 10.2.1 Observe and test the operation of a steam system.
- 10.2.2 Identify components of a steam system.
- 10.2.3 Review/test safety controls.

**Unit 11: Sheet Metal**

**Competency 11.1: Identify basic principles of drafting and blueprint reading.**

**Competency Builders:**

11.1.1 Calculate mathematic equations used in layout and design.

11.1.2 Apply basic drawing procedures.

11.1.3 Demonstrate blueprint reading.

**Competency 11.2: List sheet metal standards and materials.**

**Competency Builders:**

11.2.1 Identify basic components of duct systems.

11.2.2 Classify sheet metal standards.

11.2.3 Select duct systems and fittings (per application).

11.2.4 Examine different types of materials used in ductwork.

11.2.5 Demonstrate layout of sheet metal ducts and fittings.

**Competency 11.3: Identify different sheet metal fabrication procedures and safety issues.**

**Competency Builders:**

11.3.1 Demonstrate cutting and shearing.

11.3.2 Demonstrate bending and folding.

11.3.3 Demonstrate forming and assembly.

11.3.4 Demonstrate sealing and insulating procedures.

11.3.5 Identify various methods of fastening sheet metal.

**Competency 11.4: Identify various methods of fastening sheet metal.**

**Competency Builders:**

11.4.1 Demonstrate different methods of fastening and hanging.

11.4.2 Assemble duct work with slops and drives.

## **Unit 12: Career Development**

**Competency 12.1: Investigate career options.**

**Competency Builders:**

- 12.1.1 Determine interests and aptitude.
- 12.1.2 Identify career options.
- 12.1.3 Research interests, knowledge, abilities and skills needed in HVAC.
- 12.1.4 Select careers that best match interests and aptitudes.
- 12.1.5 Identify advantages and disadvantages of career options, including self-employment and nontraditional careers.

**Competency 12.2: Utilize career information.**

**Competency Builders:**

- 12.2.1 Research the range of career information resources.
- 12.2.2 Use a range of resources (handbooks, career materials, labor market information, and computerized career-information delivery systems, etc.) to obtain career information.
- 12.2.3 Describe opportunities associated with selected career options in HVAC.
- 12.2.4 Describe the educational requirements of various career options.
- 12.2.5 Identify individuals in selected occupations as possible information resources, role models, or mentors.

**Competency 12.3: Participate in a career exploration activity.**

**Competency Builders:**

- 12.3.1 Identify career exploration activities (e.g. job shadowing, mentoring volunteer experiences).
- 12.3.2 Recognize potential conflicts between personal characteristics and career choice areas.
- 12.3.3 Describe the impact of exploration activities on current career choices.

**Competency 12.4: Assess the relationship between educational achievement and career planning.**

**Competency Builders:**

- 12.4.1 Describe how skills developed in academics and technical programs relate to career goals.
- 12.4.2 Describe how education related to the selection of a college major, further training, and/or entry into the job market.

12.4.3 Identify skills that can apply to a variety of occupational requirements.

12.4.4 Explain the importance of possessing learning skills in the workplace.

**Competency 12.5: Develop an Individual Career Plan (ICP).**

**Competency Builders:**

12.5.1 Identify career goal(s).

12.5.2 Identify worker conditions, education, training and employment opportunities related to select career goals(s).

12.5.3 Recognize employment requirements, including criminal record check, driving record, personal hygiene and drug-free work environment.

12.5.4 Describe school and community resources available to help achieve career goal(s).

12.5.5 Recognize that changes may require retraining and upgrading of employee's skills.

**Competency 12.6: Annually review/revise the ICP.**

**Competency Builders:**

12.6.1 Identify experiences that have reinforced/changed selection of the specific career goal(s) listed on the ICP.

12.6.2 Modify the career goal(s) and educational plans on the ICP.

12.6.3 Ensure that parents or guardians provide input into the ICP process.

12.6.4 Identify the correlation between the ICP and the actual courses to be taken in high school.

12.6.5 Identify the correlation between the ICP and postsecondary training, adult education, or employment.

**Unit 13: Decision Making and Problem Solving**

**Competency 13.1: Apply decision-making techniques in the workplace.**

**Competency Builders:**

13.1.1 Identify the decision to be made.

13.1.2 Compare alternatives.

13.1.3 Determine the consequences of each alternative.

13.1.4 Make decisions based on values and goals.

13.1.5 Evaluate the decision made.

**Competency 13.2: Apply problem-solving techniques in the workplace.**

**Competency Builders:**

13.2.1 Diagnose the problem, its urgency and its causes.

13.2.2 Identify alternatives and their consequences in relation to the problem.

13.2.3 Recognize multicultural and nonsexist dimension of problem solving.

13.2.4 Explore possible solutions to the problem using a variety of industry resources.

13.2.5 Compare/contrast the advantages and disadvantages of each solution.

13.2.6 Determine and implement an appropriate action.

13.2.7 Evaluate results of action implemented.

## **Unit 14: Work Ethic**

**Competency 14.1: Evaluate the relationship of self-esteem to work ethic.**

**Competency Builders:**

14.1.1 Identify special characteristics and abilities in self and others.

14.1.2 Identify internal and external factors that affect to self-esteem.

14.1.3 Identify how individual characteristics relate to achieving personal, social, educational, and career goals.

14.1.4 Identify the relationship between personal behavior and self-concept.

**Competency 14.2: Analyze the relationship of personal values and goals to work ethic both in and out of the workplace.**

**Competency Builders:**

14.2.1 Distinguish between values and goals.

14.2.2 Determine the importance of values and goals.

14.2.3 Evaluate how one's values affect one's goals.

14.2.4 Identify/prioritize own short-and long term goals.

14.2.5 Identify how one's values are reflected in one's work ethic.

14.2.6 Identify how interactions in the workplace affect one's work ethic.

14.2.7 Identify how life changes affect one's work ethic.

**Competency 14.3: Demonstrate work ethic.**

**Competency Builders:**

14.3.1 Examine factors that influence work ethic.

14.3.2 Display initiative.

14.3.3 Demonstrate organizational skills (e.g. recordkeeping).

14.3.4 Demonstrate dependable attendance and punctuality.

14.3.5 Adhere to schedules and deadlines.

14.3.6 Demonstrate a willingness to learn.

14.3.7 Demonstrate a willingness to accept feedback and evaluation.

14.3.8 Demonstrate interpersonal skills required for working with and for others.

14.3.9 Describe appropriate employer-employee interactions for various situations.

14.3.10 Express feelings and ideas in an appropriate manner for the workplace.

14.3.11 Identify methods of dealing with harassment, bias, and discrimination based on race, color, national origin, gender, religion, disability or age.

**Unit 15: Job-Seeking Skills**

**Competency 15.1: Prepare for employment.**

**Competency Builders:**

15.1.1 Identify traditional and nontraditional employment sources.

15.1.2 Utilize employment sources.

15.1.3 Research job opportunities, including nontraditional careers.

15.1.4 Interpret equal employment opportunity laws.

15.1.5 Inquire as to company policies/procedures and job description.

15.1.6 Examine the role/relationship between employee and employer.

15.1.7 Recognize opportunities for advancement and reasons for termination.

- 15.1.8 Explain the critical importance of personal appearance, hygiene, and demeanor throughout the employment process.
- 15.1.9 Prepare for generic employment tests and those specific to an occupation/organization.
- 15.1.10 Identify opportunities for lifelong learning.

**Competency 15.2: Develop a resume.**

**Competency Builders:**

- 15.2.1 Identify personal strengths and weaknesses.
- 15.2.2 List skills and/or abilities, career objective(s), accomplishments/achievements, educational background, work experience, volunteer/community contributions, and organizational memberships.
- 15.2.3 Select an acceptable resume format.
- 15.2.4 Use correct grammar and spelling and concise wording.
- 15.2.5 Secure references.
- 15.2.6 Complete the resume.

**Competency 15.3: Complete the job application process.**

**Competency Builders:**

- 15.3.1 Explain the importance of an application form.
- 15.3.2 Obtain job applications forms.
- 15.3.3 Demonstrate appropriate behaviors (e.g. personal appearance, hygiene, and demeanor) for obtaining job application forms in person.
- 15.3.4 Describe methods for handling illegal questions on job application forms.
- 15.3.5 Demonstrate legible written communication skills using correct grammar and spelling and concise wording.
- 15.3.6 Return application to appropriate person.
- 15.3.7 Request interview.
- 15.3.8 Follow up on application status.

**Competency 15.4: Demonstrate interviewing skills.**

**Competency Builders:**

- 15.4.1 Investigate interview procedures.
- 15.4.2 Demonstrate appropriate behaviors (e.g. appearance, hygiene and demeanor) for the interview.
- 15.4.3 Demonstrate question-and-answer techniques.
- 15.4.4 Demonstrate methods for handling difficult and/or illegal interview questions.
- 15.4.5 Use correct grammar and concise wording.

**Competency 15.5: Secure employment.**

**Competency Builders:**

- 15.5.1 Identify present and future employment opportunities within an occupation/organization.
- 15.5.2 Research the organization/company.
- 15.5.3 Use follow-up techniques to enhance employment potential.
- 15.5.4 Evaluate job offer(s).
- 15.5.5 Respond to job offer.

**Unit 16: Leadership**

**Competency 16.1: Evaluate leadership styles appropriate for the workplace.**

**Competency Builders:**

- 16.1.1 Identify characteristics of effective leaders.
- 16.1.2 Compare leadership styles.
- 16.1.3 Demonstrate effective delegation skills.
- 16.1.4 Investigate empowerment concepts.
- 16.1.5 Identify opportunities to lead in the workplace.

**Competency 16.2: Demonstrate effective teamwork skills.**

**Competency Builders:**

- 16.2.1 Identify the characteristics of a valuable team member.
- 16.2.2 Identify methods of involving each team member.

- 16.2.3 Contribute to team efficiency and success.
- 16.2.4 Determine ways to motivate team members.

**Competency 16.3: Utilize effective communication skills.**

**Competency Builders:**

- 16.3.1 Identify the importance of listening.
- 16.3.2 Demonstrate effective listening skills.
- 16.3.3 Demonstrate assertive communication techniques.
- 16.3.4 Recognize the importance of verbal and nonverbal cues and messages.
- 16.3.5 Prepare written material.
- 16.3.6 Analyze written material.
- 16.3.7 Give/receive feedback.
- 16.3.8 Communicate thoughts.
- 16.3.9 Use appropriate language.
- 16.3.10 Follow oral and written instructions.
- 16.3.11 Demonstrate effective telephone techniques.
- 16.3.12 Identify technology in communications.

**Unit 17: Entrepreneurship**

**Competency 17.1: Evaluate the role of small business.**

**Competency Builders:**

- 17.1.1 Identify the impact of small business on the local economy.
- 17.1.2 Examine the relationship of small business to National (USA) and global economy.
- 17.1.3 Identify factors that contribute to the success of small business.
- 17.1.4 Identify factors that contribute to the failure of small business.
- 17.1.5 Identify the components of a business plan.
- 17.1.6 Investigate individual/business licensing and insurance requirements (see state licensing requirements).

**Competency 17.2:                   Examine entrepreneurship as a personal career plan.**

**Competency Builders:**

- 17.2.1           Evaluate personal interest skills.
- 17.2.2           Compare personal interests and skills with those necessary for entrepreneurship.
- 17.2.3           Determine motives for becoming an entrepreneur.
- 17.2.4           Identify the advantages and disadvantages of owning a small business.
- 17.2.5           Compare business ownership to working for others.

## *Indicators of Success*

1. Improved student academic achievement
  - a. Passage of Ohio Graduation Test
  - b. Graduation rate
  - c. Higher education enrollment
  - d. Performance on standardized (exit exam) tests
  - e. Admission to post-secondary education without remedial coursework requirement
2. Increased student career-technical competency levels
  - a. Positive post-program placement data (follow-up study data)
  - b. Performance on SDE-approved competency tests
  - c. Student attainment of teamwork and problem solving competencies
  - d. Employer satisfaction
3. Improved school climate for teaching and learning
  - a. Non-traditional student program completion
  - b. Student attendance
  - c. Staff attendance
  - d. Student program completion
  - e. Student behavior data
  - f. Staff retention
  - g. Student satisfaction
  - h. Staff satisfaction
  - i. Parent satisfaction
4. Meet market share goals
  - a. Non-traditional student enrollment
  - b. Market Share: Grads 11-12
  - c. Market Share: Grades 9-10
  - d. Student enrollment (Total and Trends)
  - e. Minority student enrollment
  - f. Special needs student enrollment
  - g. Career-Technical programs delivered
  - h. College Tech-Prep enrollment

## *Assessment/Performance Measures*

Upper Valley JVS targets high performance measures and uses a variety of different ways to provide assistance to its students to achieve high level thinking skills, problem solving skills, and decision-making skills so that they can be successful in their chosen field of study. Upper Valley JVS strives to achieve high performance targets as measured by the Ohio Department of Education's High Performance Measures. These are: 1) 9<sup>th</sup> grade Proficiency Passage Rate – 90% or Ohio Graduation Exam Passage Rate, 2) Positive Post-Program Placement – 90%, 3) Work Keys Assessment Results – 90%, 4) OVCA Assessment Results – 50%, 5) Career-Technical Student Organization – 95%, 6) Career Tech Passport Rate – 100%, and 7) Student Attendance – 95%.