Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 100 INTRODUCTION TO HVAC
Unit Number: PA100

Dates: Fall 2011 **Hours:** 143.00

Unit Description / Objectives:

Student will know and be able to complete the required entry class/school forms, identify job opportunities, review course competencies, and demonstrate the safe use of tools safety practices and MSDS protocol.

Tasks:

PA101 - Identify HVAC systems.

PA102 - Describe career opportunities in the HVAC profession.

PA103 - Demonstrate awareness of the occupational requirements.

PA104 - Explain the class rules and the rationale behind them.

PA105 - Describe and display positive student/teacher and employer/employee, student/worker attributes.

PA106 - Identify basic refrigeration systems.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.2.11.A Read and understand essential content of informational texts and documents in all academic areas: i.e., Differentiate fact from opinion across a variety of texts by using complete and accurate information, coherent arguments and points of view, Distinguish between essential and nonessential information across a variety of sources, identifying the use of proper references or authorities and propaganda techniques where present, Use teacher and student established criteria for making decisions and drawing conclusions, and Evaluate text organization and content to determine the author's purpose and effectiveness according to the author's theses, accuracy, thoroughness, logic and reasoning.

  Supporting Standards/Anchors

  1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

  1.1.11.F Understand the meaning of and apply key vocabulary across the various subject areas.

  1.1.11.G Demonstrate after reading understanding and interpretation of both fiction and nonfiction text, including public documents: i.e., Make, and support with evidence, assertions about texts, Compare and contrast texts using themes, settings, characters and ideas, Make extensions to related ideas, topics or information, Assess the validity of the document based on context, Analyze the positions, arguments and evidence in public documents,

Evaluate the author's strategies, and Critique public documents to identify strategies common in public discourse.

Focus Standard/Anchor #2

- 3.1.12.A Apply concepts of systems, subsystems, feedback and control to solve complex technological problems: i.e., Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems, Apply systems analysis to predict results, Analyze and describe the function, interaction and relationship among subsystems and the system itself, Compare and contrast several systems that could be applied to solve a single problem, and Evaluate the causes of a system's inefficiency.

  Supporting Standards/Anchors

  3.1.12.B Apply concepts of models as a method to predict and understand science and technology: i.e., Evaluate technological processes by collecting data and applying mathematical models (e.g., process control), Apply knowledge of complex physical models to interpret data and apply mathematical models, Appraise the importance of computer models in interpreting science and technological systems.

  3.1.12.C Assess and apply patterns in science and technology: i.e., Assess and apply recurring patterns in natural and technological systems, Compare and contrast structure and function relationships as they relate to patterns, and Assess patterns in nature using mathematical formulas.

  3.1.12.D Analyze scale as a way of relating concepts and ideas to one another by some measure: i.e., Compare and contrast various forms of dimensional analysis, Assess the use of several units of measurement to the same problem, and Analyze and apply appropriate measurement scales when collecting data.

Connecting Standard/Anchor

- 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

  Supporting Standards/Anchors

  13.3.11.E Evaluate time management strategies and their application to both personal and work situations.

  13.1.11.B Analyze career options based on personal interests, abilities, aptitudes, achievements and goals.

  2.2.11.E Recognize that the degree of precision needed in calculating a number depends on how the results will be used and the instruments used to generate the measure.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Review career opportunities using the internet
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed.
Follow task sheet instructions to complete practical projects
Explain the basic principles of heating, ventilating, and air conditioning
Identify career opportunities available to people in the HVAC trade.
Explain the purpose and objectives of an apprentice training program.
Describe how certified apprentice training can start in high school.
Describe what the Clean Air Act means to the HVAC trade.

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Hone competition skills
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Pre/Post Test
Log/Journal
Time cards
Rubrics
Group Projects
Portfolio
Task grade sheet
Oral Presentation
Projects
Portfolio
Task project grade sheets
Diagrams

Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)

Resources/Equipment:

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 200 BASIC SAFETY
Unit Number: PA200

Dates: Fall 2011 **Hours:** 32.00

Unit Description / Objectives:

Student will know and be able to complete and demonstrate the safe use of tools, safety practices, and MSDS protocol.

Tasks:

PA201 - Identify causes of job site accidents and measures to prevent them.

PA202 - Identify job site hazards and describe measures to prevent them from occurring.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 3.7.12.A Apply advanced tools, materials and techniques to answer complex questions: i.e., Demonstrate the safe use of complex tools and machines within their specifications, Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution, and Evaluate and use technological resources to solve complex multi-step problems.

Supporting Standards/Anchors

3.1.12.B Apply concepts of models as a method to predict and understand science and technology: i.e., Evaluate technological processes by collecting data and applying mathematical models (e.g., process control), Apply knowledge of complex physical models to interpret data and apply mathematical models, Appraise the importance of computer models in interpreting science and technological systems.

3.7.12.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes: i.e., Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment, Evaluate the appropriate use of different measurement scales (macro and micro), and Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.

3.4.12.C Apply the principles of motion and force: i.e., Evaluate wave properties of frequency, wavelength and speed as applied to sound and light through different media, Propose and produce modifications to specific mechanical power systems that will improve their efficiency, and Analyze the principles of translational motion, velocity and acceleration as they relate to free fall and projectile motion, Analyze the principles of rotational motion to solve problems relating to angular momentum, and torque, Interpret a model that illustrates circular motion and acceleration, and Describe inertia, motion, equilibrium, and action/reaction concepts through words, models and mathematical symbols.

Focus Standard/Anchor #2

- 1.1.11.A Locate various texts, media and traditional resources for assigned and independent projects before reading.

  Supporting Standards/Anchors

  1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

  1.1.11.F Understand the meaning of and apply key vocabulary across the various subject areas.

  1.1.11.G Demonstrate after reading understanding and interpretation of both fiction and nonfiction text, including public documents: i.e., Make, and support with evidence, assertions about texts, Compare and contrast texts using themes, settings, characters and ideas, Make extensions to related ideas, topics or information, Assess the validity of the document based on context, Analyze the positions, arguments and evidence in public documents, Evaluate the author's strategies, and Critique public documents to identify strategies common in public discourse.

Connecting Standard/Anchor

- 13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

  Supporting Standards/Anchors

  2.11.11.B Interpret maximum and minimum values in problem situations.

  2.2.11.B Use estimation to solve problems for which an exact answer is not needed.

  2.3.11.A Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from the Internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Take notes regarding safety procedures explained in safety DVD’s

Skill:
Complete time cards describing daily work completed.
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Identify the responsibilities and personal characteristics of a professional craftsperson
Explain the role that safety plays in the construction crafts
Describe what job-site safety means
Explain the appropriate safety precautions around common job-site hazards
Demonstrate the use and care of appropriate personal protective equipment
Follow safe procedures for lifting heavy objects
Describe safe behavior on and around ladders and scaffolds
Explain the importance of the HazCom (Hazard Communication Standard) requirement and MSDS (Material Safety Data Sheets)
Describe fire prevention and fire-fighting techniques
Define safe work procedures around electrical hazards

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Hone competition skills
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Pre/Post Test
Log/Journal
Time cards
Rubrics
Group Projects
Portfolio
Task grade sheet
Oral Presentation
Projects
Portfolio
Task project grade sheets
Diagrams

Resources/Equipment:

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 300 CONSTRUCTION MATH
Unit Number: PA300

Dates: Fall 2011 **Hours:** 16.00

Unit Description / Objectives:

Student will know and be able to integrate and perform any mathematical computations required by the HVAC/Plumbing industry.

Tasks:

PA301 - Demonstrate Proficiency in Math as it relates to HVAC/R.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 3.4.12.B Apply and analyze energy sources and conversions and their relationship to heat and temperature: i.e., Determine the heat involved in illustrative chemical reactions, Evaluate mathematical formulas that calculate the efficiency of specific chemical and mechanical systems, Use knowledge of oxidation and reduction to balance complex reactions, and Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat.

  Supporting Standards/Anchors

  3.1.12.B Apply concepts of models as a method to predict and understand science and technology: i.e., Evaluate technological processes by collecting data and applying mathematical models (e.g., process control), Apply knowledge of complex physical models to interpret data and apply mathematical models, Appraise the importance of computer models in interpreting science and technological systems.

  3.1.12.C Assess and apply patterns in science and technology: i.e., Assess and apply recurring patterns in natural and technological systems, Compare and contrast structure and function relationships as they relate to patterns, and Assess patterns in nature using mathematical formulas.

  3.2.12.A Evaluate the nature of scientific and technological knowledge: i.e., Know and use the ongoing scientific processes to continually improve and better understand how things work., and Critically evaluate the status of existing theories (e.g., germ theory of disease, wave theory of light, classification of subatomic particles, theory of evolution, epidemiology of aids).

Instructional Activities:

Knowledge:
Listen and participate in lecture by completing a review sheet
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics

Skill:
Complete time cards describing daily work completed.
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Add, subtract, multiply and divide whole numbers, with and without a calculator
Use a standard ruler and a metric ruler to measure
Add, subtract, multiply, and divide fractions
Add, subtract, multiply, and divide decimals, with and without a calculator
Convert decimals to percents and percents to decimals
Convert fractions to decimals and decimals to fractions
Explain what the metric system is and how it is important in the construction trade
Recognize and use metric units of length, weight, volume, and temperature
Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Hone competition skills
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 400 TOOLS FOR HVAC/R
Unit Number: PA400

Dates: Fall 2011 **Hours:** 32.00

Unit Description / Objectives:
Student will know and be able to safely use all tools in the plumbing trade.

Tasks:
PA401 - Identify and Safely Use Basic Hand Tools Used in the Trade.

PA402 - Identify and Safely Use Basic Power Tools Used in the Trade.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 3.7.12.A Apply advanced tools, materials and techniques to answer complex questions: i.e., Demonstrate the safe use of complex tools and machines within their specifications, Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution, and Evaluate and use technological resources to solve complex multi-step problems.

  Supporting Standards/Anchors

  3.7.12.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes: i.e., Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment, Evaluate the appropriate use of different measurement scales (macro and micro), and Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.

  3.6.12.C Analyze physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems: i.e., Apply knowledge of construction technology by designing, planning and applying all the necessary resources to successfully solve a construction problem, Compare resource options in solving a specific manufacturing problem, Analyze and apply complex skills needed to process materials in complex manufacturing enterprises, Apply advanced information collection and communication techniques to successfully convey solutions to specific construction problems, Assess the importance of capital on specific construction applications, Analyze the positive and negative qualities of several different types of materials as they would relate to specific construction applications, Analyze transportation technologies of propelling, structuring, suspending, guiding, controlling and supporting, and Analyze the concepts of vehicular propulsion, guidance, control, suspension and structural systems while designing and producing specific complex transportation systems.

  3.4.12.B Apply and analyze energy sources and conversions and their relationship to heat and temperature: i.e., Determine the heat involved in illustrative chemical reactions, Evaluate mathematical formulas that calculate the efficiency of specific chemical and mechanical systems, Use knowledge of

oxidation and reduction to balance complex reactions, and Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat.

Focus Standard/Anchor #2

- 1.2.11.A Read and understand essential content of informational texts and documents in all academic areas: i.e., Differentiate fact from opinion across a variety of texts by using complete and accurate information, coherent arguments and points of view, Distinguish between essential and nonessential information across a variety of sources, identifying the use of proper references or authorities and propaganda techniques where present, Use teacher and student established criteria for making decisions and drawing conclusions, and Evaluate text organization and content to determine the author's purpose and effectiveness according to the author's theses, accuracy, thoroughness, logic and reasoning.

  Supporting Standards/Anchors

  1.2.11.B Use and understand a variety of media and evaluate the quality of material produced: i.e., Select appropriate electronic media for research and evaluate the quality of the information received, Explain how the techniques used in electronic media modify traditional forms of discourse for different purposes, and Use, design and develop a media project to demonstrate understanding (e.g., a major writer or literary period or movement).

  1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

  1.1.11.E Establish a reading vocabulary by identifying and correctly using new words acquired through the study of their relationships to other words. Use a dictionary or related reference.

Connecting Standard/Anchor

- 2.3.11.A Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.

  Supporting Standards/Anchors

  2.3.11.C Demonstrate the ability to produce measures with specified levels of precision.

  2.4.11.B Construct valid arguments from stated facts.

  2.2.11.E Recognize that the degree of precision needed in calculating a number depends on how the results will be used and the instruments used to generate the measure.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Take notes regarding safety procedures explained in safety DVD's
Identify the various hand and power tools used in the trade

Skill:
Complete time cards describing daily work completed.
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Recognize and identify some of the basic hand tools used in the construction trade
Use tools in a safe manner
Describe the basic procedures for taking care of these tools
Identify commonly used power tools of the construction trade
Use of power tools in a safe manner
Explain how to maintain power tools properly

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Hone competition skills
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Pre/Post Test
Log/Journal
Time cards
Rubrics
Group Projects
Portfolio
Task grade sheet
Oral Presentation
Projects
Portfolio
Task project grade sheets
Diagrams

Resources/Equipment:

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 500 BLUEPRINT READING
Unit Number: PA500

Dates: Fall 2011 **Hours:** 30.00

Unit Description / Objectives:

Student will know and be able to recognize and identify basic blueprint terms, components, and symbols and related information on blueprints to actual locations on the print; recognize different classifications of drawings; and interpret and use drawing dimensions.

Tasks:

PA501 - Identify types of blueprint plans.

PA502 - Read and Interpret blueprint plans.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

  Supporting Standards/Anchors

  1.1.11.E Establish a reading vocabulary by identifying and correctly using new words acquired through the study of their relationships to other words. Use a dictionary or related reference.

  1.4.11.B Write complex informational pieces (e.g., research papers, analyses, evaluations, essays): i.e., Include a variety of methods to develop the main idea, Use precise language and specific detail, Include cause and effect, Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs), and Use primary and secondary sources.

  1.5.11.B Write using well-developed content appropriate for the topic: i.e., Gather, determine validity and reliability of, analyze and organize information, Employ the most effective format for purpose and audience, and Write fully developed paragraphs that have details and information specific to the topic and relevant to the focus.

Focus Standard/Anchor #2

- 3.1.12.D Analyze scale as a way of relating concepts and ideas to one another by some measure: i.e., Compare and contrast various forms of dimensional analysis, Assess the use of several units of measurement to the same problem, and Analyze and apply appropriate measurement scales when collecting data.

  Supporting Standards/Anchors

  3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and

Ptolemaic universe theories), Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

3.2.12.B Evaluate experimental information for appropriateness and adherence to relevant science processes: i.e., Evaluate experimental data correctly within experimental limits, Judge that conclusions are consistent and logical with experimental conditions, and Interpret results of experimental research to predict new information or improve a solution.

3.2.12.D Analyze and use the technological design process to solve problems: i.e., Assess all aspects of the problem, prioritize the necessary information and formulate questions that must be answered, Propose, develop and appraise the best solution and develop alternative solutions, Implement and assess the solution, Evaluate and assess the solution, redesign and improve as necessary, and Communicate and assess the process and evaluate and present the impacts of the solution.

Connecting Standard/Anchor

- 2.3.11.C Demonstrate the ability to produce measures with specified levels of precision.

Supporting Standards/Anchors

2.10.11.A Use graphing calculators to display periodic and circular functions; describe properties of the graphs.

2.10.11.B Identify, create and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.

2.11.11.B Interpret maximum and minimum values in problem situations.

2.11.11.C Graph and interpret rates of growth/decay.

13.3.11.E Evaluate time management strategies and their application to both personal and work situations.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Review career opportunities using the internet
Identify components by using drawings and schematics

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Recognize and identify basic blueprint terms, components, and symbols
Relate information on blueprints to actual locations on the print
Recognize different classifications of drawings
Interpret and use drawing dimensions

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

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Resources/Equipment:

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

Simutech Multimedia Inc. Simulators for HVAV Training. Ottawa, ON, Canada.
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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 600 BASIC COMMUNICATION
Unit Number: PA600

Dates: Fall 2011 **Hours:** 30.00

Unit Description / Objectives:

Student will know and be able to demonstrate the appropriate reading, writing, listening, and speaking skills required to communicate in his/her trade area and in society.

Tasks:

PA601 - Demonstrate Reading, Writing, Listening, and Speaking Skills.

PA602 - Complete a Resume and Mock Interview.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.4.11.E Write a personal resume.

Supporting Standards/Anchors

1.6.11.C Speak using skills appropriate to formal speech situations: i.e., Use a variety of sentence structures to add interest to a presentation, Pace the presentation according to audience and purpose, and Adjust stress, volume and inflection to provide emphasis to ideas or to influence the audience.

1.6.11.D Contribute to discussions: i.e., Ask relevant, clarifying questions, Respond with relevant information or opinions to questions asked, Listen to and acknowledge the contributions of others, Adjust tone and involvement to encourage equitable participation, Facilitate total group participation, Introduce relevant, facilitating information, ideas and opinions to enrich the discussion, and Paraphrase and summarize as needed.

1.6.11.E Participate in small and large group discussions and presentations: i.e., Initiate everyday conversation, Select and present an oral reading on an assigned topic, Conduct interviews, Participate in a formal interview (e.g., for a job, college), Organize and participate in informal debate around a specific topic, and Use evaluation guides (e.g., National Issues Forum, Toastmasters) to evaluate group discussion (e.g., of peers, on television).

Focus Standard/Anchor #2

- 13.1.11.D Evaluate school-based opportunities for career awareness/preparation, such as, but not limited to: career days, career portfolio, community service, cooperative education, graduation/senior project, internship, job shadowing, part-time employment, registered apprenticeship and school-based enterprise.

Supporting Standards/Anchors

13.1.11.A Relate careers to individual interests, abilities, and aptitudes.

13.1.11.F Analyze the relationship between career choices and career

preparation opportunities, such as, but not limited to: associate degree, baccalaureate degree, certificate/licensure, entrepreneurship, immediate part/full time employment, industry training, military training, professional degree, registered apprenticeship, tech prep and Vocational Rehabilitation Centers.

13.2.11.A Apply effective speaking and listening skills used in a job interview.

13.2.11.B Apply research skills in searching for a job: Career Links, Internet (i.e. O-NET), Networking, Newspapers, Professional associations and resource books (that is Occupational Outlook Handbook, PA Career Guide).

13.2.11.C Develop and assemble, for career portfolio placement, career acquisition documents, such as, but not limited to: job application, letter of appreciation following an interview, letter of introduction, postsecondary education/training applications, request for letter of recommendation, and resume.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Identify components by using drawings and schematics
Complete required levels of Professional Development Program

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Participate in mock interview sessions
Demonstrate good reading, writing and speaking skills
Complete resume
Complete required levels of Professional Development Program

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Resume rubric
PDP worksheets
Time cards
Mock interview rubric

Resources/Equipment:

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

SkillsUSA Publications, 2008. Professional Development Program Levels 1 and 2

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 700 BASIC EMPLOYABILITY
Unit Number: PA700

Dates: Fall 2011 **Hours:** 30.00

Unit Description / Objectives:

Student will know and be able to demonstrate employability skills and interpersonal skills.

Tasks:

PA701 - Demonstrate Employability Skills.

PA702 - Demonstrate Interpersonal Skills.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.4.11.E Write a personal resume.

Supporting Standards/Anchors

1.6.11.C Speak using skills appropriate to formal speech situations: i.e., Use a variety of sentence structures to add interest to a presentation, Pace the presentation according to audience and purpose, and Adjust stress, volume and inflection to provide emphasis to ideas or to influence the audience.

1.6.11.D Contribute to discussions: i.e., Ask relevant, clarifying questions, Respond with relevant information or opinions to questions asked, Listen to and acknowledge the contributions of others, Adjust tone and involvement to encourage equitable participation, Facilitate total group participation, Introduce relevant, facilitating information, ideas and opinions to enrich the discussion, and Paraphrase and summarize as needed.

1.6.11.E Participate in small and large group discussions and presentations: i.e., Initiate everyday conversation, Select and present an oral reading on an assigned topic, Conduct interviews, Participate in a formal interview (e.g., for a job, college), Organize and participate in informal debate around a specific topic, and Use evaluation guides (e.g., National Issues Forum, Toastmasters) to evaluate group discussion (e.g., of peers, on television).

Focus Standard/Anchor #2

- 13.1.11.A Relate careers to individual interests, abilities, and aptitudes.

Supporting Standards/Anchors

13.1.11.B Analyze career options based on personal interests, abilities, aptitudes, achievements and goals.

13.1.11.C Analyze how the changing roles of individuals in the workplace relate to new opportunities within career choices.

13.2.11.A Apply effective speaking and listening skills used in a job interview.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Complete PDP requirements set by Monroe Career & Technical Institute

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Pre/Post Test
Log/Journal
Time cards
Rubrics
Group Projects
Portfolio
Task grade sheet
Oral Presentation
Projects
Portfolio
Task project grade sheets
Diagrams

Resources/Equipment:

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.
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Skills USA 2008 Professional Development Program work books

Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 800 PIPING PRACTICES
Unit Number: PA800

Dates: Fall 2011 **Hours:** 187.00

Unit Description / Objectives:

Student will know and be able to identify, assemble and install copper, plastic, and steel piping.

Tasks:

PA801 - Identify Piping Material.

PA802 - Select, Measure, Cut, and Ream Piping and Tubing.

PA803 - Assemble Piping Projects and Pressure Test According to Trade Standards.

PA804 - Identify and assemble PVC pipe and fittings.

PA805 - Assemble copper tubing projects and pressure test according to trade standards.

PA806 - Solder copper tubing.

PA807 - Braze and silver solder ACR Tubing.

PA808 - Identify and demonstrate proper use of fittings and tools for steel (black) pipe.

PA809 - Cut, ream, thread and assemble steel (black) pipe.

PA810 - Assemble CSST (Corrugated Stainless Steel Gas Tubing) Projects.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.1.11.E Establish a reading vocabulary by identifying and correctly using new words acquired through the study of their relationships to other words. Use a dictionary or related reference.

Supporting Standards/Anchors

1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

1.4.11.B Write complex informational pieces (e.g., research papers, analyses, evaluations, essays): i.e., Include a variety of methods to develop the main idea, Use precise language and specific detail, Include cause and effect, Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs), and Use primary and secondary sources.

1.5.11.B Write using well-developed content appropriate for the topic: i.e., Gather, determine validity and reliability of, analyze and organize information,

Employ the most effective format for purpose and audience, and Write fully developed paragraphs that have details and information specific to the topic and relevant to the focus.

Focus Standard/Anchor #2

- 3.1.12.D Analyze scale as a way of relating concepts and ideas to one another by some measure: i.e., Compare and contrast various forms of dimensional analysis, Assess the use of several units of measurement to the same problem, and Analyze and apply appropriate measurement scales when collecting data.

  Supporting Standards/Anchors

  3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories), Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

  3.2.12.B Evaluate experimental information for appropriateness and adherence to relevant science processes: i.e., Evaluate experimental data correctly within experimental limits, Judge that conclusions are consistent and logical with experimental conditions, and Interpret results of experimental research to predict new information or improve a solution.

  3.2.12.D Analyze and use the technological design process to solve problems: i.e., Assess all aspects of the problem, prioritize the necessary information and formulate questions that must be answered, Propose, develop and appraise the best solution and develop alternative solutions, Implement and assess the solution, Evaluate and assess the solution, redesign and improve as necessary, and Communicate and assess the process and evaluate and present the impacts of the solution.

Connecting Standard/Anchor

- 2.10.11.B Identify, create and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.

  Supporting Standards/Anchors

  2.11.11.B Interpret maximum and minimum values in problem situations.

  2.11.11.E Estimate areas under curves using sequences of areas.

  2.3.11.C Demonstrate the ability to produce measures with specified levels of precision.

  13.3.11.E Evaluate time management strategies and their application to both personal and work situations.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Assemble and operate the tools used for connection of piping material
Prepare tubing and fittings for assembly
Use appropriate method for assembly
Identify the purposes and uses of piping material
Identify inert gases needed to purge tubing for proper assembly

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 900 BASIC ELECTRICITY
Unit Number: PA900

Dates: Fall 2011 **Hours:** 250.00

Unit Description / Objectives:

Student will know and be able to state how electrical power is generated and distributed and describe how voltage, current, resistance, and power are related. The student will also know and be able to use Ohm's law to calculate the current, voltage, and resistance in a circuit and use the power formula to calculate how much power is consumed by a circuit. Finally, the student will know and be able to describe the differences between series and parallel circuits.

Tasks:

PA901 - Describe methods of producing electricity using appropriate terms.

PA902 - Calculate basic electrical quantities using Ohm's law.

PA903 - Explain how magnetism is used in different HVAC components.

PA904 - Identify Safe Electrical Practices.

PA905 - Recognize and draw various types of electrical schematics and symbols.

PA906 - Demonstrate proper wiring techniques.

PA907 - Demonstrate electrical testing.

PA908 - Wire series circuit, parallel circuit, and series / parallel circuit.

PA909 - Install electric disconnects, circuit breakers and fuses.

PA910 - Identify and test capacitors.

PA911 - Identify electrical motors and their applications.

PA912 - Recognize motor control protection and start devices.

PA913 - Recognize Electrical Codes.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.1.11.A Locate various texts, media and traditional resources for assigned and independent projects before reading.

Supporting Standards/Anchors

1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

1.1.11.E Establish a reading vocabulary by identifying and correctly using new

words acquired through the study of their relationships to other words. Use a dictionary or related reference.

1.4.11.B Write complex informational pieces (e.g., research papers, analyses, evaluations, essays): i.e., Include a variety of methods to develop the main idea, Use precise language and specific detail, Include cause and effect, Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs), and Use primary and secondary sources.

Focus Standard/Anchor #2

- 3.1.12.D Analyze scale as a way of relating concepts and ideas to one another by some measure: i.e., Compare and contrast various forms of dimensional analysis, Assess the use of several units of measurement to the same problem, and Analyze and apply appropriate measurement scales when collecting data.

Supporting Standards/Anchors

3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories), Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

3.2.12.B Evaluate experimental information for appropriateness and adherence to relevant science processes: i.e., Evaluate experimental data correctly within experimental limits, Judge that conclusions are consistent and logical with experimental conditions, and Interpret results of experimental research to predict new information or improve a solution.

3.2.12.D Analyze and use the technological design process to solve problems: i.e., Assess all aspects of the problem, prioritize the necessary information and formulate questions that must be answered, Propose, develop and appraise the best solution and develop alternative solutions, Implement and assess the solution, Evaluate and assess the solution, redesign and improve as necessary, and Communicate and assess the process and evaluate and present the impacts of the solution.

Connecting Standard/Anchor

- 2.10.11.A Use graphing calculators to display periodic and circular functions; describe properties of the graphs.

Supporting Standards/Anchors

2.3.11.C Demonstrate the ability to produce measures with specified levels of precision.

2.11.11.B Interpret maximum and minimum values in problem situations.

2.3.11.A Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
State how electrical power is generated and distributed
Describe how voltage, current, resistance, and power are related
Use Ohm's law to calculate the current, voltage, and resistance in a circuit
Use the power formula to calculate how much power is consumed by a circuit
Describe the differences between series and parallel circuits
Recognize and describe the purpose and operation of the various electrical components used in HVAC equipment
State and demonstrate the safety precautions that must be followed when working on electrical equipment
Make voltage, current, and resistance measurements using electrical test equipment

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 1000 INTRODUCTION TO COOLING

Unit Number: PA1000

Dates: Fall 2011 **Hours:** 151.00

Unit Description / Objectives:

Student will know and be able to explain how heat transfer occurs in a cooling system and demonstrate an understanding of the terms and concepts used in the refrigeration cycle.

Tasks:

PA1001 - Measure temperature and pressure of a cooling system.

PA1002 - Calculate Superheat and Subcooling.

PA1003 - Locate and describe components of the basic refrigeration cycle.

PA1004 - Apply Pressure Temperature Charts for various refrigerants.

PA1005 - Describe the functions of compressors.

PA1006 - Describe the functions of condensers.

PA1007 - Describe the functions of evaporators.

PA1008 - Describe the functions of metering devices.

PA1009 - Identify secondary components used in the air conditioning and refrigeration industry.

PA1010 - Evaluate effects of airflow on system performance.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.5.11.B Write using well-developed content appropriate for the topic: i.e., Gather, determine validity and reliability of, analyze and organize information, Employ the most effective format for purpose and audience, and Write fully developed paragraphs that have details and information specific to the topic and relevant to the focus.

Supporting Standards/Anchors

1.4.11.B Write complex informational pieces (e.g., research papers, analyses, evaluations, essays): i.e., Include a variety of methods to develop the main idea, Use precise language and specific detail, Include cause and effect, Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs), and Use primary and secondary sources.

1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

1.1.11.A Locate various texts, media and traditional resources for assigned and independent projects before reading.

Focus Standard/Anchor #2

- 3.4.12.B Apply and analyze energy sources and conversions and their relationship to heat and temperature: i.e., Determine the heat involved in illustrative chemical reactions, Evaluate mathematical formulas that calculate the efficiency of specific chemical and mechanical systems, Use knowledge of oxidation and reduction to balance complex reactions, and Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat.

  Supporting Standards/Anchors

  3.2.12.D Analyze and use the technological design process to solve problems: i.e., Assess all aspects of the problem, prioritize the necessary information and formulate questions that must be answered, Propose, develop and appraise the best solution and develop alternative solutions, Implement and assess the solution, Evaluate and assess the solution, redesign and improve as necessary, and Communicate and assess the process and evaluate and present the impacts of the solution.

  3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories), Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

  3.1.12.D Analyze scale as a way of relating concepts and ideas to one another by some measure: i.e., Compare and contrast various forms of dimensional analysis, Assess the use of several units of measurement to the same problem, and Analyze and apply appropriate measurement scales when collecting data.

Connecting Standard/Anchor

- 2.3.11.A Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.

  Supporting Standards/Anchors

  2.10.11.A Use graphing calculators to display periodic and circular functions; describe properties of the graphs.

  2.10.11.B Identify, create and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.

  2.11.11.E Estimate areas under curves using sequences of areas.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Explain how heat transfer occurs in a cooling system, demonstrating an understanding of the terms and concepts used in the refrigeration cycle
Calculate the temperature and pressure relationships at key points in the refrigeration cycle
Under supervision, use temperature- and pressure-measuring instruments to make readings at key points in the refrigeration cycle
Identify commonly used refrigerants and demonstrate the procedures for handling these refrigerants
Identify the major components of a cooling system and explain how each type works
Identify the major accessories available for cooling systems and explain how each works
Identify the control devices used in cooling systems and explain how each works
State the correct methods to be used when piping a refrigeration system

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 1100 INTRODUCTION TO HEATING

Unit Number: PA1100

Dates: Fall 2011 **Hours:** 210.00

Unit Description / Objectives:

Student will know and be able to explain the three methods by which heat is transferred and give an example of each, describe how combustion occurs and identify the by-products of combustion, and identify the various types of fuels used in heating.

Tasks:

PA1101 - Describe the principles of combustion.

PA1102 - Identify temperatures and pressures of a heating system.

PA1103 - Identify components of various heating systems.

PA1104 - Perform maintenance on a gas furnace.

PA1105 - Troubleshoot conventional / condensing gas heating equipment.

PA1106 - Identify oil heating equipment.

PA1107 - Install and adjust oil fired equipment.

PA1108 - Perform annual preventive maintenance on oil fired equipment.

PA1109 - Troubleshoot oil fired equipment.

PA1110 - Identify electric heating equipment.

PA1111 - Install heating/air conditioning thermostats according to manufacturer's standards.

PA1112 - Identify components and controls of steam heating systems.

PA1113 - Perform Combustion Analysis on oil and gas fired equipment.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.1.11.A Locate various texts, media and traditional resources for assigned and independent projects before reading.

Supporting Standards/Anchors

1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

1.1.11.E Establish a reading vocabulary by identifying and correctly using new words acquired through the study of their relationships to other words. Use a dictionary or related reference.

1.4.11.B Write complex informational pieces (e.g., research papers, analyses, evaluations, essays): i.e., Include a variety of methods to develop the main idea, Use precise language and specific detail, Include cause and effect, Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs), and Use primary and secondary sources.

Focus Standard/Anchor #2

- 3.4.12.B Apply and analyze energy sources and conversions and their relationship to heat and temperature: i.e., Determine the heat involved in illustrative chemical reactions, Evaluate mathematical formulas that calculate the efficiency of specific chemical and mechanical systems, Use knowledge of oxidation and reduction to balance complex reactions, and Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat.

  Supporting Standards/Anchors

  3.1.12.D Analyze scale as a way of relating concepts and ideas to one another by some measure: i.e., Compare and contrast various forms of dimensional analysis, Assess the use of several units of measurement to the same problem, and Analyze and apply appropriate measurement scales when collecting data.

  3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories), Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

  3.2.12.B Evaluate experimental information for appropriateness and adherence to relevant science processes: i.e., Evaluate experimental data correctly within experimental limits, Judge that conclusions are consistent and logical with experimental conditions, and Interpret results of experimental research to predict new information or improve a solution.

Connecting Standard/Anchor

- 2.10.11.A Use graphing calculators to display periodic and circular functions; describe properties of the graphs.

  Supporting Standards/Anchors

  2.11.11.B Interpret maximum and minimum values in problem situations.

  2.11.11.E Estimate areas under curves using sequences of areas.

  2.3.11.C Demonstrate the ability to produce measures with specified levels of precision.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Explain the three methods by which heat is transferred and give an example of each
Describe how combustion occurs and identify the byproducts of combustion
Identify the various types of fuels used in heating
Identify the major components and accessories of an induced draft and condensing gas furnace and explain the function of each component
State the factors that must be considered when installing a furnace
Identify the major components of a gas furnace and describe how each works
With supervision, use a manometer to measure and adjust manifold pressure on a gas furnace
Identify the major components of an oil furnace and describe how each works.
Describe how an electric furnace works
With supervision, perform basic furnace preventive maintenance procedures such as cleaning and filter replacement

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
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Use proper safety precautions when using /operating hand tools
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Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 1200 AIR DISTRIBUTION SYSTEMS

Unit Number: PA1200

Dates: Fall 2011 **Hours:** 90.00

Unit Description / Objectives:

Student will know and be able to describe the airflow and pressures in a basic forced air distribution system, explain the differences between propeller and centrifugal fans and blowers, and identify the various types of duct systems and explain why and where each type is used. Student will also know and be able to demonstrate of explain the installation of metal, fiberboard, and flexible duct and demonstrate or explain the installation of fittings and transitions used in duct systems.

Tasks:

PA1201 - Identify and sketch different types of duct systems.

PA1202 - Identify and describe the different types of duct system components.

PA1203 - Measure temperature, humidity and air velocities.

PA1204 - Determine velocity, static, and total air pressures in a system.

PA1205 - Determine airflow volume using velocity pressure method.

PA1206 - Perform basic duct fabrication functions.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.1.11.A Locate various texts, media and traditional resources for assigned and independent projects before reading.

Supporting Standards/Anchors

1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

1.1.11.E Establish a reading vocabulary by identifying and correctly using new words acquired through the study of their relationships to other words. Use a dictionary or related reference.

1.4.11.B Write complex informational pieces (e.g., research papers, analyses, evaluations, essays): i.e., Include a variety of methods to develop the main idea, Use precise language and specific detail, Include cause and effect, Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs), and Use primary and secondary sources.

Focus Standard/Anchor #2

- 3.1.12.D Analyze scale as a way of relating concepts and ideas to one another by some measure: i.e., Compare and contrast various forms of dimensional analysis,

Assess the use of several units of measurement to the same problem, and Analyze and apply appropriate measurement scales when collecting data.

Supporting Standards/Anchors

3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories), Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

3.2.12.B Evaluate experimental information for appropriateness and adherence to relevant science processes: i.e., Evaluate experimental data correctly within experimental limits, Judge that conclusions are consistent and logical with experimental conditions, and Interpret results of experimental research to predict new information or improve a solution.

3.2.12.D Analyze and use the technological design process to solve problems: i.e., Assess all aspects of the problem, prioritize the necessary information and formulate questions that must be answered, Propose, develop and appraise the best solution and develop alternative solutions, Implement and assess the solution, Evaluate and assess the solution, redesign and improve as necessary, and Communicate and assess the process and evaluate and present the impacts of the solution.

Connecting Standard/Anchor

- 13.3.11.G Evaluate the impact of lifelong learning on career retention and advancement.

Supporting Standards/Anchors

2.10.11.A Use graphing calculators to display periodic and circular functions; describe properties of the graphs.

2.10.11.B Identify, create and solve practical problems involving right triangles using the trigonometric functions and the Pythagorean Theorem.

2.11.11.B Interpret maximum and minimum values in problem situations.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet

Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Describe the airflow and pressures in a basic forced-air distribution system
Explain the differences between propeller and centrifugal fans and blowers
Identify the various types of duct systems and explain why and where each type is used
Demonstrate or explain the installation of metal, fiberboard, and flexible duct
Demonstrate or explain the installation of fittings and transitions used in duct systems
Demonstrate of explain the use and installation of diffusers, registers, and grilles used in duct systems
Demonstrate or explain the use and installation of dampers used in duct systems

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
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Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 1300 INTRODUCTION TO HYDRONIC SYSTEMS
Unit Number: PA1300

Dates: Fall 2011 **Hours:** 15.00

Unit Description / Objectives:

Student will know and be able to describe hot-water heating system components.

Tasks:

PA1301 - Describe hot –water heating system components.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 1.1.11.A Locate various texts, media and traditional resources for assigned and independent projects before reading.

  Supporting Standards/Anchors

  1.1.11.D Identify, describe, evaluate and synthesize the essential ideas in text. Assess those reading strategies that were most effective in learning from a variety of texts.

  1.1.11.E Establish a reading vocabulary by identifying and correctly using new words acquired through the study of their relationships to other words. Use a dictionary or related reference.

  1.4.11.B Write complex informational pieces (e.g., research papers, analyses, evaluations, essays): i.e., Include a variety of methods to develop the main idea, Use precise language and specific detail, Include cause and effect, Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs), and Use primary and secondary sources.

Focus Standard/Anchor #2

- 3.4.12.B Apply and analyze energy sources and conversions and their relationship to heat and temperature: i.e., Determine the heat involved in illustrative chemical reactions, Evaluate mathematical formulas that calculate the efficiency of specific chemical and mechanical systems, Use knowledge of oxidation and reduction to balance complex reactions, and Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat.

  Supporting Standards/Anchors

  3.1.12.D Analyze scale as a way of relating concepts and ideas to one another by some measure: i.e., Compare and contrast various forms of dimensional analysis, Assess the use of several units of measurement to the same problem, and Analyze and apply appropriate measurement scales when collecting data.

  3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and

their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories), Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

3.2.12.B Evaluate experimental information for appropriateness and adherence to relevant science processes: i.e., Evaluate experimental data correctly within experimental limits, Judge that conclusions are consistent and logical with experimental conditions, and Interpret results of experimental research to predict new information or improve a solution.

Connecting Standard/Anchor

- 2.10.11.A Use graphing calculators to display periodic and circular functions; describe properties of the graphs.

Supporting Standards/Anchors

2.11.11.B Interpret maximum and minimum values in problem situations.

2.11.11.E Estimate areas under curves using sequences of areas.

2.3.11.C Demonstrate the ability to produce measures with specified levels of precision.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
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Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

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Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 1400 LEAK DETECTION, EVACUATION, RECOVERY AND CHARGING
Unit Number: PA1400

Dates: Fall 2011 **Hours:** 125.00

Unit Description / Objectives:

Student will know and be able to identify the common types of leak detectors and explain how each is used.

Tasks:

PA1401 - Locate refrigerant leaks using common types of leak detectors.

PA1402 - Perform refrigerant recovery.

PA1403 - Perform system evacuation and dehydration.

PA1404 - Determine when to charge with liquid versus vapor.

PA1405 - Weigh in correct system charge (when appropriate).

PA1406 - Charge systems using superheat method when appropriate (e.g., fixed restriction).

PA1407 - Charge systems using subcooling method when appropriate (e.g., TXV, AXV).

PA1408 - Demonstrate knowledge of EPA Section 608.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 3.1.12.B Apply concepts of models as a method to predict and understand science and technology: i.e., Evaluate technological processes by collecting data and applying mathematical models (e.g., process control), Apply knowledge of complex physical models to interpret data and apply mathematical models, Appraise the importance of computer models in interpreting science and technological systems.

Supporting Standards/Anchors

3.1.12.A Apply concepts of systems, subsystems, feedback and control to solve complex technological problems: i.e., Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems, Apply systems analysis to predict results, Analyze and describe the function, interaction and relationship among subsystems and the system itself, Compare and contrast several systems that could be applied to solve a single problem, and Evaluate the causes of a system's inefficiency.

3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories), Analyze how models, systems and technologies

have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

3.2.12.C Apply the elements of scientific inquiry to solve multi-step problems: i.e., Generate questions about objects, organisms and/or events that can be answered through scientific investigations, Evaluate the appropriateness of questions, Design an investigation with adequate control and limited variables to investigate a question, Organize experimental information using analytic and descriptive techniques, Evaluate the significance of experimental information in answering the question, and Project additional questions from a research study that could be studied.

Focus Standard/Anchor #2

- 3.4.12.A Apply concepts about the structure and properties of matter: i.e., Apply rules of systematic nomenclature and formula writing to chemical substances, Classify and describe, in equation form, types of chemical and nuclear reactions, Explain how radioactive isotopes that are subject to decay can be used to estimate the age of materials, Explain how the forces that bind solids, liquids and gases affect their properties, Characterize and identify important classes of compounds (e.g., acids, bases, salts), Apply the conservation of energy concept to fields as diverse as mechanics, nuclear particles and studies of the origin of the universe, Apply the predictability of nuclear decay to estimate the age of materials that contain radioactive isotopes, and Quantify the properties of matter (e.g., density, solubility coefficients) by applying mathematical formulas.

  Supporting Standards/Anchors

  3.4.12.B Apply and analyze energy sources and conversions and their relationship to heat and temperature: i.e., Determine the heat involved in illustrative chemical reactions, Evaluate mathematical formulas that calculate the efficiency of specific chemical and mechanical systems, Use knowledge of oxidation and reduction to balance complex reactions, and Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat.

  3.7.12.A Apply advanced tools, materials and techniques to answer complex questions: i.e., Demonstrate the safe use of complex tools and machines within their specifications, Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution, and Evaluate and use technological resources to solve complex multi-step problems.

  3.7.12.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes: i.e., Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment, Evaluate the appropriate use of different measurement scales (macro and micro), and Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.

Connecting Standard/Anchor

- 1.1.11.A Locate various texts, media and traditional resources for assigned and independent projects before reading.

Supporting Standards/Anchors

1.1.11.G Demonstrate after reading understanding and interpretation of both fiction and nonfiction text, including public documents: i.e., Make, and support with evidence, assertions about texts, Compare and contrast texts using themes, settings, characters and ideas, Make extensions to related ideas, topics or information, Assess the validity of the document based on context, Analyze the positions, arguments and evidence in public documents, Evaluate the author's strategies, and Critique public documents to identify strategies common in public discourse.

2.2.11.A Develop and use computation concepts, operations and procedures with real numbers in problem-solving situations.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Identify the common types of leak detectors and explain how each is used
Demonstrate skill in performing leak detection tests
Identify the service equipment used for evacuating a system and explain why each item of equipment is used
Demonstrate skill in performing system evacuation and dehydration
Identify the service equipment used for recovering refrigerant from a system and for recycling the recovered refrigerant, and explain why each item of equipment is used
Demonstrate skill in charging refrigerant into a system

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
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Know and follow the established safety rules at all times

Assessment:

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Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
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Practical tasks include related assignments applicable to the task and will be graded

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Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 1500 TROUBLESHOOTING GAS HEATING
Unit Number: PA1500

Dates: Fall 2011 **Hours:** 15.00

Unit Description / Objectives:

Student will know and be able to identify the major components of fuel systems and describe the function of each component including natural gas, LP gas, and fuel oil.

Tasks:

PA1501 - Perform gas burner flame proving tests according to trade standards.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 3.7.12.A Apply advanced tools, materials and techniques to answer complex questions: i.e., Demonstrate the safe use of complex tools and machines within their specifications, Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution, and Evaluate and use technological resources to solve complex multi-step problems.

  Supporting Standards/Anchors

  3.7.12.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes: i.e., Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment, Evaluate the appropriate use of different measurement scales (macro and micro), and Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.

  3.1.12.A Apply concepts of systems, subsystems, feedback and control to solve complex technological problems: i.e., Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems, Apply systems analysis to predict results, Analyze and describe the function, interaction and relationship among subsystems and the system itself, Compare and contrast several systems that could be applied to solve a single problem, and Evaluate the causes of a system's inefficiency.

  3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories), Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

  3.2.12.A Evaluate the nature of scientific and technological knowledge: i.e., Know and use the ongoing scientific processes to continually improve and better understand how things work., and Critically evaluate the status of

existing theories (e.g., germ theory of disease, wave theory of light, classification of subatomic particles, theory of evolution, epidemiology of aids).

Focus Standard/Anchor #2

- 2.6.11.B Use appropriate technology to organize and analyze data taken from the local community.

  Supporting Standards/Anchors

  4.2.12.B Analyze factors affecting the availability of renewable and nonrenewable resources: i.e., Evaluate the use of natural resources and offer approaches for using them while diminishing waste, and Compare the economics of different areas based on the availability and accessibility of the natural resources.

  4.2.12.C Analyze factors that influence the availability of natural resources: i.e., Compare the use of natural resources in different countries, and Determine how delivery systems influence the availability of resources at the local, regional and national level.

  4.8.12.B Analyze technology's role on natural resource sustainability: i.e., Explain how technology has decreased the use of raw natural resources, Explain how technology has impacted the efficiency of the use of natural resources, and Analyze the role of technology in the reduction of pollution.

Connecting Standard/Anchor

- 1.1.11.H Demonstrate fluency and comprehension in reading: i.e., Read familiar materials aloud with accuracy, Self-correct mistakes, Use appropriate rhythm, flow, meter and pronunciation, Read a variety of genres and types of text, and Demonstrate comprehension (Standard 1.1.11.G.). (Recommend: 25 books/year)

  Supporting Standards/Anchors

  1.1.11.A Locate various texts, media and traditional resources for assigned and independent projects before reading.

  1.2.11.A Read and understand essential content of informational texts and documents in all academic areas: i.e., Differentiate fact from opinion across a variety of texts by using complete and accurate information, coherent arguments and points of view, Distinguish between essential and nonessential information across a variety of sources, identifying the use of proper references or authorities and propaganda techniques where present, Use teacher and student established criteria for making decisions and drawing conclusions, and Evaluate text organization and content to determine the author's purpose and effectiveness according to the author's theses, accuracy, thoroughness, logic and reasoning.

  1.4.11.B Write complex informational pieces (e.g., research papers, analyses, evaluations, essays): i.e., Include a variety of methods to develop the main idea, Use precise language and specific detail, Include cause and effect, Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs), and Use primary and secondary sources.

  1.4.11.D Maintain a written record of activities, course work, experience, honors and interests.

1.6.11.A Listen to others: i.e., Ask clarifying questions, Synthesize information, ideas and opinions to determine relevancy, and Take notes.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Identify the major components of the following fuel systems and describe the function of each component: natural gas, LP gas, and fuel oil
Identify the physical properties of each type of fuel
Identify the safety precautions and potential hazards associated with each type of fuel and system

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 1600 TROUBLESHOOTING COOLING
Unit Number: PA1600

Dates: Fall 2011 **Hours:** 15.00

Unit Description / Objectives:

Student will know and be able to explain the basic principles applicable to all control systems.

Tasks:

PA1601 - Identify control system components.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 3.7.12.A Apply advanced tools, materials and techniques to answer complex questions: i.e., Demonstrate the safe use of complex tools and machines within their specifications, Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution, and Evaluate and use technological resources to solve complex multi-step problems.

  Supporting Standards/Anchors

  3.7.12.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes: i.e., Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment, Evaluate the appropriate use of different measurement scales (macro and micro), and Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.

  3.6.12.C Analyze physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world problems: i.e., Apply knowledge of construction technology by designing, planning and applying all the necessary resources to successfully solve a construction problem, Compare resource options in solving a specific manufacturing problem, Analyze and apply complex skills needed to process materials in complex manufacturing enterprises, Apply advanced information collection and communication techniques to successfully convey solutions to specific construction problems, Assess the importance of capital on specific construction applications, Analyze the positive and negative qualities of several different types of materials as they would relate to specific construction applications, Analyze transportation technologies of propelling, structuring, suspending, guiding, controlling and supporting, and Analyze the concepts of vehicular propulsion, guidance, control, suspension and structural systems while designing and producing specific complex transportation systems.

  3.1.12.A Apply concepts of systems, subsystems, feedback and control to solve complex technological problems: i.e., Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems, Apply systems analysis to predict results, Analyze and

describe the function, interaction and relationship among subsystems and the system itself, Compare and contrast several systems that could be applied to solve a single problem, and Evaluate the causes of a system's inefficiency.

3.1.12.B Apply concepts of models as a method to predict and understand science and technology: i.e., Evaluate technological processes by collecting data and applying mathematical models (e.g., process control), Apply knowledge of complex physical models to interpret data and apply mathematical models, Appraise the importance of computer models in interpreting science and technological systems.

Focus Standard/Anchor #2

- 1.1.11.G Demonstrate after reading understanding and interpretation of both fiction and nonfiction text, including public documents: i.e., Make, and support with evidence, assertions about texts, Compare and contrast texts using themes, settings, characters and ideas, Make extensions to related ideas, topics or information, Assess the validity of the document based on context, Analyze the positions, arguments and evidence in public documents, Evaluate the author's strategies, and Critique public documents to identify strategies common in public discourse.

  Supporting Standards/Anchors

  1.1.11.A Locate various texts, media and traditional resources for assigned and independent projects before reading.

  1.1.11.E Establish a reading vocabulary by identifying and correctly using new words acquired through the study of their relationships to other words. Use a dictionary or related reference.

  1.4.11.B Write complex informational pieces (e.g., research papers, analyses, evaluations, essays): i.e., Include a variety of methods to develop the main idea, Use precise language and specific detail, Include cause and effect, Use relevant graphics (e.g., maps, charts, graphs, tables, illustrations, photographs), and Use primary and secondary sources.

  1.4.11.D Maintain a written record of activities, course work, experience, honors and interests.

Connecting Standard/Anchor

- 2.3.11.A Select and use appropriate units and tools to measure to the degree of accuracy required in particular measurement situations.

  Supporting Standards/Anchors

  13.2.11.E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans With Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-Advocacy, scheduling/time management, team building, technical literacy and technology.

  13.1.11.A Relate careers to individual interests, abilities, and aptitudes.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Explain the basic principles applicable to all control systems
Identify the various types of electomechanical, electronic, and pneumatic HVAC controls, and explain their function and operation
Identify the service instruments needed to troubleshoot HVAC components

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 1700 HEAT PUMPS
Unit Number: PA1700

Dates: Fall 2011 **Hours:** 35.00

Unit Description / Objectives:

Student will know and be able to describe the principles of reverse-cycle heating.

Tasks:

PA1701 - Explain heat pump modes of operation.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 3.1.12.A Apply concepts of systems, subsystems, feedback and control to solve complex technological problems: i.e., Apply knowledge of control systems concept by designing and modeling control systems that solve specific problems, Apply systems analysis to predict results, Analyze and describe the function, interaction and relationship among subsystems and the system itself, Compare and contrast several systems that could be applied to solve a single problem, and Evaluate the causes of a system's inefficiency.

  Supporting Standards/Anchors

  3.1.12.B Apply concepts of models as a method to predict and understand science and technology: i.e., Evaluate technological processes by collecting data and applying mathematical models (e.g., process control), Apply knowledge of complex physical models to interpret data and apply mathematical models, Appraise the importance of computer models in interpreting science and technological systems.

  3.1.12.E Evaluate change in nature, physical systems and man made systems: i.e., Evaluate fundamental science and technology concepts and their development over time (e.g., DNA, cellular respiration, unified field theory, energy measurement, automation, miniaturization, Copernican and Ptolemaic universe theories), Analyze how models, systems and technologies have changed over time (e.g., germ theory, theory of evolution, solar system, cause of fire), Explain how correlation of variables does not necessarily imply causation, and Evaluate the patterns of change within a technology (e.g., changes in engineering in the automotive industry).

  3.2.12.A Evaluate the nature of scientific and technological knowledge: i.e., Know and use the ongoing scientific processes to continually improve and better understand how things work., and Critically evaluate the status of existing theories (e.g., germ theory of disease, wave theory of light, classification of subatomic particles, theory of evolution, epidemiology of aids).

Focus Standard/Anchor #2

- 3.4.12.B Apply and analyze energy sources and conversions and their relationship to heat and temperature: i.e., Determine the heat involved in illustrative chemical reactions, Evaluate mathematical formulas that calculate the efficiency of specific

chemical and mechanical systems, Use knowledge of oxidation and reduction to balance complex reactions, and Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat.

Supporting Standards/Anchors

3.7.12.A Apply advanced tools, materials and techniques to answer complex questions: i.e., Demonstrate the safe use of complex tools and machines within their specifications, Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution, and Evaluate and use technological resources to solve complex multi-step problems.

3.7.12.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes: i.e., Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment, Evaluate the appropriate use of different measurement scales (macro and micro), and Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.

Connecting Standard/Anchor

- 1.1.11.G Demonstrate after reading understanding and interpretation of both fiction and nonfiction text, including public documents: i.e., Make, and support with evidence, assertions about texts, Compare and contrast texts using themes, settings, characters and ideas, Make extensions to related ideas, topics or information, Assess the validity of the document based on context, Analyze the positions, arguments and evidence in public documents, Evaluate the author's strategies, and Critique public documents to identify strategies common in public discourse.

  Supporting Standards/Anchors

  1.1.11.E Establish a reading vocabulary by identifying and correctly using new words acquired through the study of their relationships to other words. Use a dictionary or related reference.

  1.1.11.F Understand the meaning of and apply key vocabulary across the various subject areas.

  1.6.11.A Listen to others: i.e., Ask clarifying questions, Synthesize information, ideas and opinions to determine relevancy, and Take notes.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job

Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Describe the principles of reverse-cycle heating
Identify heat pumps by type and general classification
List the components of heat pump systems

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

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Use of several residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Monroe Career & Technical Institute
Course Name: HVAC

Unit Name: 1800 COMPUTER FUNDAMENTALS
Unit Number: PA1800

Dates: Fall 2011 **Hours:** 35.00

Unit Description / Objectives:

Student will know and be able to complete PDP Internet research requirements set by Monroe Career & Technical Institute.

Tasks:

PA1801 - Identify components of a desktop computer.

PA1802 - Utilize the Internet for research.

Standards / Assessment Anchors

Focus Standard/Anchor #1

- 13.1.11.A Relate careers to individual interests, abilities, and aptitudes.

  Supporting Standards/Anchors

  13.1.11.C Analyze how the changing roles of individuals in the workplace relate to new opportunities within career choices.

  13.1.11.H Review personal high school plan against current personal career goals and select postsecondary opportunities based upon personal career interests.

  13.2.11.B Apply research skills in searching for a job: Career Links, Internet (i.e. O-NET), Networking, Newspapers, Professional associations and resource books (that is Occupational Outlook Handbook, PA Career Guide).

Focus Standard/Anchor #2

- 3.7.12.B Evaluate appropriate instruments and apparatus to accurately measure materials and processes: i.e., Apply and evaluate the use of appropriate instruments to accurately measure scientific and technologic phenomena within the error limits of the equipment, Evaluate the appropriate use of different measurement scales (macro and micro), and Evaluate the utility and advantages of a variety of absolute and relative measurement scales for their appropriate application.

  Supporting Standards/Anchors

  3.7.12.A Apply advanced tools, materials and techniques to answer complex questions: i.e., Demonstrate the safe use of complex tools and machines within their specifications, Select and safely apply appropriate tools, materials and processes necessary to solve complex problems that could result in more than one solution, and Evaluate and use technological resources to solve complex multi-step problems.

Instructional Activities:

Knowledge:
Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:
Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Complete PDP requirements set by Monroe Career & Technical Institute

Remediation:
Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:
Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
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Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
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