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| FTC *HVACR**Tyrrell*My Syllabus includes all of the items, tasks, and employability skills. Students that **learn**, **understand** and **practice** these items will be prime targets for Heat, Air and Building Maintenance jobs $$$$$$$ |
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| **A. Appreciate and apply all personal and workplace safety procedures** |
| 1. Demonstrate appropriate work place safety practices (e.g., combustibles, electrical, hand tools, power tools, lockout/tag out, fall protection, refrigerants and pressurized gases)  |
| 2. Identify types, purposes, and operation of fire extinguishers and suppression systems |
| 3. Inspect lab for hazards  |
| 4. Recognize when first aid is needed for occupational injuries and follow proper procedures  |
| 5. Demonstrate victim removal procedures from an electrical conductor  |
| 6. Apply MSDS (Material Safety Data Sheet) information to material use  |
| 7. Adhere to applicable local, state, and federal regulations (EPA [environmental], DOT [moving vehicle] and OSHA [worker safety])  |
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| **B. Identify and apply refrigeration principles and practices consistent with industry standards**  |
| 1. Read and interpret pressure-temperature charts |
| 2. Explain principles of refrigeration and heat transfer theory |
| 3. Identify refrigerants/oil types and their characteristics and uses  |
| 4. Operate a gauge manifold set  |
| 5. Leak-test system  |
| 6. Evacuate and measure vacuum level to 500 microns  |
| 7. Recover and recycle refrigerants  |
| 8. Charge system to manufacturer’s specifications  |
| 9. Describe the operation of refrigeration system accessories (e.g., receivers, accumulators, filter/dryer, sight glasses, and valves)  |
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| **C. Identify and apply piping principles and practices**  |
| 1. Identify tubing and fitting types  |
| 2. Perform copper tubing operations (e.g., cutting, flaring, soldering, brazing, bending, and swaging)  |
| 3. Install, repair, and replace aluminum tubing  |
| 4. Install and replace PVC tubing and pipe reaming, threading, and connecting) |
| 5. Perform gas pipe operations (e.g., cutting, reaming, threading, and connecting)  |
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| **D. Apply basic electrical theory to construct circuits and solve electrical circuit problems**  |
| 1. Apply the principles of alternating and direct current  |
| 2. Differentiate between common single- and three-phase voltage systems (e.g., 240V, 60Hz, single-phase; 208V, 60Hz, three-phase; 240V, 60Hz, three-phase; and 480V, 60Hz, three-phase systems)  |
| 3. Read and interpret voltage, ampere, ohm, and watt meters  |
| 4. Read and interpret electrical schematic and wiring diagrams  |
| 5. Install electrical power and control circuits  |
| 6. Apply the Ohm’s law principles as related to series, parallel, and series-parallel circuits  |
| 7. Apply the principles of electrical circuit protection (e.g., fuses, circuit breakers, disconnect switches, and grounds)  |
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| **E. Identify and apply electric motor principles and practices consistent with industry standards**  |
| 1. Apply the operating principles of electric motors  |
| 2. Recognize the application of various types of electric motors  |
| 3. Recognize the application of various types of capacitors  |
| 4. Test capacitors  |
| 5. Explain the principles and operation of electric motor protective devices |
| 6. Interpret electric motor specifications (e.g., horsepower and voltage)  |
| 7. Install and connect electric motors |
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| **F. Apply the principles of control systems consistent with industry and safety standards** |
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| 1. Apply the principles of safety devices and operating control circuits (e.g. pressure switches and thermostats)  |
| 2. Apply the principles of electromechanical control devices (e.g., relays, contractors, magnetic starters, timers and sequences) |
| 3. Apply the principles of electronic control devices (e.g., ignition modules and electronic timers)  |
| 4. Install/service mechanical control devices (e.g., pneumatic and water controls)  |
| 5. Install/service electromechanical control devices  |
| 6. Install/replace transformers  |
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| **G. Install and repair residential/light commercial cooling/heating systems consistent with** **industry and safety standards** |
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| 1. Install or replace compressor  |
| 2. Install or replace condensing unit  |
| 3. Repair or replace condenser  |
| 4. Repair or replace evaporator  |
| 5. Replace, repair, and adjust metering devices  |
| 6. Clean up a contaminated system  |
| 7. Describe operation of a heat pump  |
| 8. Describe zoned heating and cooling systems |
| 9. Start and check residential heating and cooling systems  |
| 10. Measure and adjust conditioned air flow  |
| 11. Describe vacuum pump and micron gauge applications |
| 12. Repair, replace, and service electronic air cleaner  |
| 13. Pump down unit  |
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| **H. Perform preventive maintenance on Residential / Light commercial cooling /heating systems**  |
| 1. Perform preventive maintenance on air- conditioning systems  |
| 2. Perform preventive maintenance on heating systems  |
| 3. Perform preventive maintenance on heat pumps  |
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| **I. Install air distribution system consistent with**  |
|  **industry and safety standards** |
| 1. Design air-distribution system |
| 2. Fabricate, insulate, and install air-distribution systems |
| 3. Size and assemble vents  |
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| **J. Troubleshoot residential/light commercial**  |
|  **cooling/heating systems** |
| 1. Troubleshoot control devices (e.g., mechanical,  |
|  electromechanical and electronic)  |
| 2. Analyze compressor operation (e.g., electrical and mechanical)  |
| 3. Analyze and replace a four-way reversing valve  |
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| 4. Troubleshoot electric motors |
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| 5. Troubleshoot LP and natural gas fired heating systems |
| 6. Troubleshoot electric heating systems  |
| 7. Troubleshoot heat pumps  |
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| 8. Troubleshoot oil-fired heating systems |
| 9. Troubleshoot air-conditioning systems |
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| **K. Demonstrate professional customer relations**  |
|  **skills** |
| 1. Explain operation of the system’s thermostat - including a heat pump stat |
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| 2. Explain system operation in Lay Terms - compression condensation, expansion, vaporization |
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| **L. Demonstrate leadership skills in the**  |
|  **classroom, industry, and society** |
| 1. Demonstrate an understanding of SkillsUSA, its  |
|  structure and activities  |
| 2. Demonstrate an understanding of one’s personal  |
|  values  |
| 3. Perform tasks related to effective personal  |
|  management skills  |
| 4. Demonstrate interpersonal skills  |
| 5. Demonstrate etiquette and courtesy  |
| 6. Demonstrate effectiveness in oral and written  |
|  communication |
| 7. Develop and maintain a code of professional  |
|  ethics  |
| 8. Maintain an appropriate professional appearance  |
| 9. Perform basic tasks related to securing and  |
|  terminating employment  |
| 10. Perform basic parliamentary procedures in a  |
|  group meeting  |
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| **M. Explain and demonstrate skills in a specialization area identified by the instructor** |
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| 1 Describe total procedure of a service call starting with the initial customer description of problem to the cleanup and paperwork |
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| 2. Describe the entire procedure to identify an integrated circuit board malfunction and the steps you would take to find a replacement and order it in a timely manner |
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