



**ACT 101
PRINCIPLES AND PRACTICES OF REFRIGERATION
MASTER COURSE SYLLABUS**

****Instructors will provide students with additional course-specific information, including attendance/makeup policies, assignment/test scheduling, and instructor contact information, as necessary and appropriate.****

Prerequisite(s): ACT 100

Corequisite(s): None

Quarter(s) Offered: All

Class Hours: 5

Lab Hours: 5

Credit Hours: 7

Course Description:

Introduces the use of refrigeration tools, materials, and procedures needed to install, repair, and service refrigeration systems. Topics include: refrigeration tools; piping practices; service valves; leak testing; refrigerant recovery, recycling, and reclamation; evacuation; charging; and safety.

Student Learning Outcomes: Upon successful completion of this course, the student should be able to:

Refrigeration Tools

- Identify different types of tubing used in refrigeration industry.
- Identify various fittings commonly used in refrigeration industry.
- Observe annealing copper tubing demonstration.
- Bend copper tubing.
- Braze or silver solder lines or fittings, such as condensers, receivers, evaporators, tubing, or piping.
- Flare copper tubing
- Measure and cut copper tubing
- Remove or install threaded fittings.
- Soft solder lines or fittings, such as condensers, receivers, evaporators, tubing, or piping.
- Silver braze lines or fittings.

- Silver solder lines or fittings.
- Identify and discuss potential hazards in working with copper tubing.
- Use hand tools common to the refrigeration industry.
- Swage copper tubing

Piping Practices

- Determine the correct refrigerant line sizes.
- Install insulation.
- Identify various types of pipe.
- Remove or install threaded fittings.
- Measure and cut pipes.
- Remove or install piping or tubing, such as water, refrigerant, or fuel lines.
- Identify and discuss safety concerns found in working with pipe and pipe fittings.
- Identify the name, size, and application of piping materials and fittings.
- Light Air-Acetylene Torch
- Solder copper tubing using 95/5
- Light Oxy-Acetylene Torch
- Braze copper tubing using phos-copper alloy.
- Braze copper tubing using silver brazing alloy.

Service Valves

- Identify and discuss the various types of gauges
- Calibrate gauges.
- Inspect gauges or lines.
- Test gauges using pressure test bench.
- Purge lines.
- Discuss the potential hazards of working with gauges.
- Identify types of service valves
- Use service valves to control the refrigerant flow
- Use service valves to gain access to the refrigeration system
- Use a refrigeration manifold to gain access to the refrigeration system
- Use a refrigeration manifold to read refrigeration system pressures

Leak Testing

- Discuss the various types of leak detectors.
- Locate refrigerant leaks using electronic leak detectors
- Locate refrigerant leaks using soap solutions.
- Perform pressure tests.
- Identify hazards of working with refrigerants.
- Identify the type of refrigerant in a system.
- Safely operate a nitrogen regulator
- Pressurize a system with nitrogen
- Locate refrigerant leaks using soap bubbles.
- Locate refrigerant leaks using electronic leak detectors.
- Locate refrigerant leaks using a halide leak detector.
- Locate refrigerant leaks using ultraviolet light.
- Locate refrigerant leaks using ultrasonic sound.

Refrigerant Recovery, Recycling, and Reclamation

- Discuss stratospheric ozone depletion.
- Discuss regulations relating to the discharge of ozone layer depleting substances.
- Discuss refrigerant recovery, recycling, and reclamation procedures as means of reducing ozone layer depletion.
- Describe recovery and reclamation equipment use.
- Demonstrate refrigerant recovery and recycling procedures.
- Demonstrate safe procedures in recovering, recycling, and transferring refrigerants.
- Safely handle refrigerant recovery cylinders.
- Pump down a system with a king valve.
- Pump down a residential system with installation valves.
- Use a refrigerant recovery machine to recover the charge from a packaged unit.
- Use a refrigerant recovery machine to recover the charge from a split system.
- Use a refrigerant recovery machine to recover the charge from a small commercial refrigeration unit.

Evacuation

- List the proper procedures for evacuating refrigeration systems.
- Identify and explain the equipment used in evacuating a refrigeration system.
- Evacuate refrigeration or air conditioning systems.
- Purge lines.
- Discuss desiccants.
- Remove or install gauges.
- Replace drier filters or cartridges.
- Discuss safety factors involved in evacuating refrigeration systems.
- Change the oil in a vacuum pump.
- Use an electronic thermistor vacuum gauge to read vacuum
- Pull a deep vacuum on a refrigeration system.
- Pull a multiple vacuum on a refrigeration system.

Charging

- Charge refrigeration system.
- Determine performance by using P-T chart.
- Safely handle disposable refrigerant cylinders.
- Check system charge using a pressure-temperature chart
- Check system charge using a superheat charging chart
- Check system charge using a subcooling charging chart
- Weigh a full charge into an evacuated refrigeration system in liquid form.
- Add vapor to a system with a low charge.
- Add liquid to a zeotropic system with a low charge.

Safety

- Write a summary of safety concerns for this section.
- Use hand tools safely
- Use power tools safely
- Safely use air acetylene torch
- Practice safe soldering procedures

- Safely use oxyacetylene torch
- Practice safe brazing procedures
- Handle refrigerants safely

Grading Scale: The grading scale is detailed in the *Catalog and Student Handbook* and listed below for reference. All faculty members follow this scale when assigning grades to reflect a given student's performance in the classroom.

Grade	Numerical Equivalent	Grade Point
A/A*	90-100	4
B/B*	80-89	3
C/C*	70-79	2
D/D*	60-69	1
F/F*	0-59	0

Effective Summer Quarter 2006, Athens Technical College replaced the S/U grading system used for learning support classes with an A*-F* grading system. The registrar uses an asterisk (A*, B*, C*, D*, F*, W*, WF*, WP*) to designate learning support course grades on transcripts and grade reports because these grades are not components of the quarterly grade point average.

Required Textbook(s), including ISBN:

Title: *Fundamentals of HVAC/R*

Author: Stanfield, Skaves (2009)

Publisher: Pearson/Prentice Hall, Columbus Ohio

ISBN 13: 978-0-13-222367-6

Required Equipment/Tools/Resources: (See policy sheet for a list of tool suppliers.)

- Safety glasses
- Work gloves
- Calculator
- Ruler, English & Metric
- Digital pocket thermometer
- 6 In 1 Driver with Flat, Phillips, 1/4" Hex, And 5/16" Hex Bits
- Tool box, pouch, etc.
- Large straight screwdriver
- Medium straight screwdriver
- Small straight screwdriver for thermostats
- Large Phillips screwdriver
- Medium Phillips screwdriver
- Nut-driver Set 1/4, 5/16, 11/32, 3/8, 7/16
- 8" adjustable wrench
- 12" adjustable wrench
- Channellock pliers

- Schraeder valve core tool
- Refrigeration valve stem ratchet wrench
- Refrigeration Manifold Gauge set for R 22 & R410a
- Hex adapter for refrigeration ratchet wrench
- Hex Key Set (Allen wrench)

Instructional Technologies Employed:

Instruction is provided in lecture format, supplemented with audio-visual presentations and computer simulations. Lab work is performed individually during any of the available open lab periods.

Attendance: Regular class attendance is important and expected. The college considers both tardiness and early departure from class as forms of absenteeism. Students absent from class for any reason are still responsible for all work missed. Instructors have the right to determine whether work missed can be made up and have the liberty to set reasonable expectations for attendance based on frequency of class meetings and on the instructional delivery method, subject, type, and level of the class. Class attendance policies will be clearly stated for students by their respective instructors on separate documents (course outlines/schedules) or appendices to the master syllabus.

Grading Policy and Criteria: Final course grades are derived from homework assignments (15%), quizzes (15%), lab work (50%) and a written final (20%). Students are graded on lab assignments according to the grading rubric for that assignment. Students are responsible for completing each assignment and submitting each completed assignment to an instructor for evaluation. The student's shop grade is determined by averaging the project grades using a weighted average. Work which is not completed will be averaged as a grade of 0.

Work Ethics: To fulfill the responsibility to teach essential workplace ethics, the college evaluates program students on attendance, character, teamwork, appearance, attitude, productivity, organizational skills, communication, cooperation, and respect. Because students are preparing for employment, it is essential that they become accustomed to standards of behavior in the workplace. At the conclusion of the quarter, faculty members assign separate numerical work ethics grades which appear beside the course letter grades on both transcripts and grade reports. The work ethics grading scale is as follows: 3 (Exceeds Expectations), 2 (Meets Expectations), 1 (Needs Improvement), and 0 (Unacceptable).

Academic Honesty: Academic honesty is expected at all times. Any student found to have engaged in academic misconduct such as cheating, plagiarism, or collusion is subject to disciplinary sanctions as outlined in the Student Code of Conduct detailed in the *ATC Catalog and Student Handbook*. The term "plagiarism" includes, but is not limited to, the use, by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. The term "collusion" includes, but is not limited to, the unauthorized collaboration with any other person in preparing work offered for academic credit. Students are advised that faculty routinely use **turnitin.com** both to prevent plagiarism and to assist in verifying when/if it has occurred.

Course Withdrawal: Students may withdraw from a course without academic penalty until the midpoint of the quarter (as stated in the Academic Calendar published in the *ATC Catalog and Student Handbook*). By withdrawing before the midpoint of the quarter, the student is automatically assigned a grade of W, which does not affect quarterly or cumulative grade point average. Grades of W will affect satisfactory academic progress for financial aid purposes. **Students who stop attending class(es) without formally withdrawing risk earning a final grade of F, which will appear on the academic transcript.** Refer to the *ATC Catalog and Student Handbook* for further details.

Academic Support Center: The Academic Support Centers of Athens Technical College (ATC) provide free tutoring for enrolled students. Both instructors and peer tutors provide tutoring in almost all subjects offered by the college. Information about the Center is accessible via the ATC website at www.athenstech.edu. To find out the specific services available on the Athens, Greene, and Walton Campuses, please call (706) 583-2839. To contact the Academic Support Center on the Elbert County Campus, please call (706) 213-2129.

Americans with Disabilities Act: Any student who believes he/she is eligible for accommodations in the classroom and/or during testing due to a documented disability is encouraged to contact the Director of Student Support Services at (706) 355-5081, or the Coordinator of Disability Services at (706) 355-5006, to apply for assistance. It is our goal at Athens Technical College to provide equal access to education for all students.

Cell Phones and Electronic Devices: Students are strictly prohibited from using cell phones and personal electronic devices within college-owned/operated facilities without the explicit permission of a faculty or staff member.

Food/Drinks in Classroom: Food and beverages (other than water) are not allowed in classrooms/labs.

Warranty of Graduates: The Department of Technical and Adult Education warrants every graduate of technical programs in which students may earn technical certificates of credit, diplomas, or associate degrees. The warranty guarantees that graduates demonstrate the knowledge and skills and can perform each competency as identified in the industry-validated standards established for every program of study. If one of our graduates educated under a standard program or his/her employer finds that the graduate is deficient in one or more competencies as defined in the course/program standards, Athens Technical College will retrain the employee at no instructional cost to the employee or the employer. This guarantee is in effect for two years after graduation.

TEACH Act: According to the TEACH Act of 2002, Athens Technical College is obligated to advise you that instructional material included in this course may be subject to copyright protection. As such, you must not share, duplicate, transmit, or store the material of this course beyond the purpose and time frame explicitly stated in the syllabus of your course. If you are not certain whether a particular piece of material is covered by copyright protection, you should contact your instructor and obtain his/her written clarification. Failing to observe copyright protection is a violation of law.

