

JEFFERSON COLLEGE

COURSE SYLLABUS

HRA145

**PIPING DESIGN, SIZING, AND INSTALLATION FOR
HEATING, REFRIGERATION, AND AIR CONDITIONING**

2 Credit Hours

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HRA145 Piping Design, Sizing, and Installation for HRA

I. CATALOGUE DESCRIPTION

- A. Pre- and/or co-requisite: Reading Proficiency
- B. 2 Credit Hours
- C. Piping Design, Sizing, and Installation for Heating, Refrigeration, and Air Conditioning teaches students to identify pipe fittings, size gas and Freon lines, and properly assemble pipe fittings for heating, refrigeration, and air conditioning systems. (F,S)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

Identify pipe fittings used for black iron, copper, PVC, and trac piping	Quizzes Lab projects
Properly size gas lines, Freon lines, and drainage systems	Quizzes Lab projects
Correctly assemble pipe fittings used for black iron, copper, PVC, and trac piping	Quizzes Lab projects
Explain how to determine the best materials for different piping uses	Quizzes Exams

III. OUTLINE OF TOPICS

- A. Piping Materials
 - 1. Black Iron
 - a. Wall thicknesses
 - b. Fittings
 - i. Proper uses of various fittings
 - ii. Flow problems caused by fittings
 - c. Pipe threading methods
 - d. Fuel run support systems
 - e. Materials used to seal threaded connections
 - 2. PVC
 - a. Various wall thicknesses
 - b. Temperature restrictions
 - c. Used as furnace vent
 - i. CPVC where required
 - ii. Proper sloping
 - iii. Termination kits

- d. Condensate drain designs
 - i. Primary
 - ii. Secondary
- 3. Copper
 - a. Usage for gas piping
 - i. Propane
 - ii. Natural gas
 - iii. Freon
 - b. Brazing
 - i. Proper rods
 - ii. Use of nitrogen to prevent oxidation
 - c. Flared fittings
 - i. Flaring
 - ii. Double flaring
 - d. Compression fittings
 - i. Use internally in appliances
 - ii. Use on external fuel runs
- 4. Trac Piping
 - a. Connection methods
 - b. Required support methods
 - c. Distribution manifolds
 - d. Terminal connection methods
- B. Piping Sizing
 - 1. Freon lines
 - a. Manufacturers requirements for different sized units
 - b. Maximum lengths before upsizing
 - 2. Gas lines
 - a. Propane
 - i. Sizing requirements for various loads
 - ii. Pressure drops per length of pipe
 - iii. Pressure drops for various fittings
 - b. Natural gas
 - i. Sizing requirements for various loads
 - ii. Pressure drops per length of pipe
 - iii. Pressure drops for various fittings
 - 3. Air lines
- C. Assembly, Insulation, and Installation
 - 1. Freon line assembly and insulation of same
 - 2. Gas lines
 - a. Copper fuel runs
 - i. Brazed
 - ii. Flared

- b. Black iron
 - i. Fittings and their uses
 - ii. Pipe compounds for lubrication
 - iii. Pipe cutting and threading
 - c. Trac piping: Fittings and their uses
- D. Piping Design and Usage
 - 1. Acceptable locations
 - a. Copper
 - b. Black iron
 - c. Trac piping
 - 2. Outdoor Installation
 - a. Black iron painting requirements
 - b. Trac pipe
 - 3. Underground installations
 - a. Copper
 - b. PVC
 - c. Trac Piping
 - d. Tracer wire

IV. METHOD(S) OF INSTRUCTION

- A. Lecture
- B. Labs
- C. Videos
- D. Demonstrations

V. REQUIRED TEXTBOOK(S)

William C Whitman, *Refrigeration & Air Conditioning Technology*, (Current Edition), Clifton Park, NY: Delmar Cengage Learning

VI. REQUIRED MATERIALS

2 Pipe Wrenches \$50.00

VII. SUPPLEMENTAL REFERENCES

Handouts

VIII. METHOD OF EVALUATION

- A. Exams 50%
- B. Quizzes 10%
- C. Lab projects 40%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (TC101; phone 636-481-3169).

X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College website, <http://www.jeffco.edu>).

XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for more details.

XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.