

JEFFERSON COLLEGE

COURSE SYLLABUS

HRA210

ELECTRIC AND HYDRONIC HEAT

2 Credit Hours

Prepared by
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HRA210 Electric and Hydronic Heat

I. CATALOGUE DESCRIPTION

- A. Prerequisite: HRA101 Electricity for HVAC with a grade of “C” or better
HRA105 Principles of Refrigeration with a grade of “C” or better
EPA Certification with a grade of “C” or better
COMPASS pre-algebra score of at least 33 within the past two years,
ACT pre-algebra score of 16 or higher within the past two years, or
MTH001 with a grade of “B” or better
Reading Proficiency
- B. 2 Semester Credit Hours
- C. Electric and Hydronic Heat studies the theory, installation, diagnosis, and service of electric and hydronic heating systems. This includes both hot water and steam systems. (F,S)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

Practice wiring electric and hydronic systems	Exams Homework Quizzes Projects Lab
Diagnose problems with controls for electric furnaces and boilers	Exams Homework Quizzes Projects Lab
Determine proper hot water piping methods and pipe sizing	Exams Homework Quizzes Projects Lab
Diagnose problems in servicing electric furnaces and hydronic systems	Exams Homework Quizzes Projects Lab
Diagnose problems in various hydronic piping systems	Exams Lab

III. OUTLINE OF TOPICS

- A. Unit 30 Electric Heat
 - 1. Introduction
 - 2. Portable Electric Heating Devices
 - 3. Radiant Heating Panels
 - 4. Electric Baseboard Heating
 - 5. Unit Heaters
 - 6. Electric Hydronic Boilers
 - 7. Central Forced-Air Electric Furnaces
 - 8. Automatic Controls for Forced-Air Electric Furnaces
 - 9. The Low-Voltage Thermostat
 - 10. Controlling Multiple Stages
 - 11. Wiring Diagrams
 - 12. Control Circuits for Forced-Air Electric Furnaces
 - 13. Fan Motor Circuits
 - 14. Contactors for Controlling Electric Furnaces
 - 15. Airflow in Electric Furnaces
 - 16. Service Technician Calls

- B. Unit 33 Hydronic Heat
 - 1. Introduction to Hydronic Heating
 - 2. The Heat Source a)
 - The Boiler
 - b) Cast-Iron Boilers
 - c) Steel Boilers
 - d) Copper Water-Tube Boilers e)
 - The Geothermal Heat Pump
 - 3. The Basic Hydronic System
 - a) Expansion Tank
 - b) Circulator/Centrifugal Pumps
 - 4. The Point of No Pressure Change
 - 5. Other Hydronic System Components
 - a) Air Separator and Air Scoop b)
 - Air Vent
 - c) Temperature-Limiting Control (Aquastat)
 - d) High-Limit Control
 - e) Water-Regulating Valve (Pressure-Reducing Valve)
 - f) Pressure Relief Valve
 - g) Low-Water Cut-Off
 - h) Zone Valves
 - i) Balancing Valves
 - j) Pressure Differential Bypass Valve

- k) Flow Control Valve
- l) Outdoor Reset Control
- m) Thermostatic Radiator Valves
- n) Finned-Tube Baseboard Units
- 6. High-Temperature Hydronic Piping Systems
 - a) The Series Loop System
 - b) The One-Pipe System
 - c) The Two-Pipe Direct-Return System
 - d) Primary-Secondary Pumping
- 7. Radiant, Low-Temperature Hydronic Piping Systems
 - a) How the Body Functions as a Radiator
 - b) The Radiant System
 - c) Heat Sources for Radiant Heating Systems
 - d) Radiant Heating Piping
 - e) Piping Arrangements
- 8. Combination (High- and Low-Temperature) Piping Systems
- 9. Tankless Domestic Hot Water Heaters
- 10. Service Technician Calls

IV. METHOD(S) OF INSTRUCTION

- A. Classroom Lecture
- B. Specialty Lectures by Industry Personnel

V. REQUIRED TEXTBOOK(S)

Whitman, Johnson; *Refrigeration and Air Conditioning Technology* (current edition); Tomczyk, Silberstein; Delmar Publications

VI. REQUIRED MATERIALS

HRA Tool Kit

VII. SUPPLEMENTAL REFERENCES

None

VIII. METHODS OF EVALUATION

A.	Theory, Tests, Quizzes, Homework	45%
B.	Shop/Lab	45%
C.	Attendance/Participation	10%

IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; 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.