

JEFFERSON COLLEGE

COURSE SYLLABUS

HRA205

RESIDENTIAL GAS HEATING SYSTEMS

4 Credit Hours

Prepared by
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HRA205 Residential Gas Heating Systems

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 Universal Certification
 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. 4 Semester Credit Hours
- C. Residential Gas Heating Systems studies the theory, installation, diagnosis, and service of residential gas heating systems. This course covers high and standard efficiency gas heating systems. (F,S)

II. EXPECTED LEARNING OUTCOMES/CORRESPONDING ASSESSMENT MEASURES

Wire gas furnaces and gas furnace controls	Exams Homework Quizzes Projects Lab
Diagnose gas furnace controls for high efficiency and standing pilot	Exams Homework Quizzes Projects Lab
Design gas piping and pipe sizing	Exams Homework Quizzes Projects Lab
Diagnose problems in servicing gas fueled heating with electric wiring and control wiring	Exams Homework Quizzes Projects Lab
Diagnose indoor air quality problems and how to correct them	Exams Homework Quizzes Projects Lab

Diagnose various venting methods	Exams Lab
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III. OUTLINE OF TOPICS

- A. Unit 31 Gas Heat
 - 1. Introduction to Gas-Fired, Forced-Hot-Air Furnaces
 - 2. Types of Furnaces
 - a) Upflow
 - b) Low-Boy
 - c) Downflow
 - d) Horizontal
 - e) Multipoise or Multipositional
 - 3. Gas Fuels
 - a) Natural Gas
 - b) Liquefied Petroleum
 - c) Manifold Pressures
 - d) Pressures Per Square Inch
 - 4. Gas Combustion
 - 5. Gas Regulators
 - 6. Gas Valve
 - 7. Solenoid Valve
 - 8. Diaphragm Valve
 - 9. Heat Motor-Controlled Valve
 - 10. Automatic Combination Valve
 - a) Standing Pilot Automatic Gas Valves
 - b) Intermittent Pilot Automatic Gas Valves
 - c) Direct Burner Automatic Gas Valves
 - 11. Manifold
 - 12. Orifice
 - 13. Burners
 - 14. Heat Exchangers
 - 15. Fan Switch
 - 16. Limit Switch
 - 17. Pilots
 - 18. Safety Devices at the Standing Pilot
 - a) Thermocouples and Thermopiles
 - b) Bimetallic Safety Devices
 - c) Liquid-Filled Remote Bulb
 - 19. Ignition Systems
 - a) Intermittent Pilot Ignition

- b) Direct-Spark Ignition (DSI)
 - c) Hot Surface Ignition
- 20. Flame Rectification
 - a) Troubleshooting Flame Rectification Systems
 - b) Flame Rectification Maintenance
- 21. High-Efficiency Gas Furnaces
 - a) High-Efficiency Gas Furnaces Anatomy
 - b) Dew Point Temperature
 - c) Excess Air
 - d) Furnace Efficiency Ratings
- 22. Electronic ignition Modules and Integrated Furnace Controllers
 - a) 100% Shutoff System
 - b) Non-100% Shutoff System
 - c) Continuous Retry with 100% Shutoff
 - d) Lockout
 - e) Soft Lockout
 - f) Hard Lockout
 - g) Prepurge
 - h) Interpurge
 - i) Postpurge
 - j) Electronic Ignition Module Wiring and Terminal Naming
 - k) Smart Valve
 - l) Pulse Furnace
- 23. Two-Stage Gas Furnaces
- 24. Modulating Gas Furnaces
- 25. Venting
- 26. Gas Piping
- 27. Gas Furnace Wiring Diagrams and Troubleshooting Flowcharts
- 28. Troubleshooting the Safety Pilot-Proving Device---the Thermocouple
- 29. Troubleshooting Spark Ignition and Intermittent Pilot Systems
- 30. Combustion Efficiency

IV. METHOD(S) OF INSTRUCTION

- A. Classroom Lecture
- B. Lab Demonstrations
- C. Specialty Lectures by Industry Personnel

V. REQUIRED TEXTBOOK(S)

Whitman, Johnson, Tomczyk, Silberstein; *Refrigeration and Air Conditioning Technology* (Current Edition); 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.