

Course Outline of Record

1. Course Code: ACR-080
2.
  - a. Long Course Title: Gas Heating
  - b. Short Course Title: GAS HEATING
3.
  - a. Catalog Course Description:
 

This course presents the basic principles of gas-fired furnaces. Students are introduced to gas heating, gas combustion, gas burners gas ignition systems, safety and operating controls, installation practices, ventilation, venting, combustion air and gas troubleshooting. Emphasis is on service and maintenance of residential gas furnaces.
  - b. Class Schedule Course Description:
 

Students are introduced to servicing gas fired furnaces.
  - c. Semester Cycle (*if applicable*): N/A
  - d. Name of Approved Program(s):
    - AIR CONDITIONING AND REFRIGERATION AS Degree for Employment Preparation
    - AIR CONDITIONING AND REFRIGERATION Certificate of Achievement
4. Total Units: 3.00      Total Semester Hrs: 72.00  
 Lecture Units: 2.5      Semester Lecture Hrs: 45.00  
 Lab Units: 0.5      Semester Lab Hrs: 27.00  
 Class Size Maximum: 27      Allow Audit: No  
 Repeatability No Repeats Allowed  
 Justification 0
5. Prerequisite or Corequisite Courses or Advisories:
 

*Course with requisite(s) and/or advisory is required to complete Content Review Matrix (CCForm1-A)*

 Advisory: ACR 064 or  
 Advisory: ACR 064 Concurrent enrollment
6. Textbooks, Required Reading or Software: (*List in APA or MLA format.*)
  - a. John Tomczyk; Eugene Silberstein, B.A., M.S., BEAP, CMHE; Bill Whitman; Bill Johnson (2012). Refrigeration Air Conditioning Technology (8th/e). Boston, MA 02210 Cengage Learning. ISBN: 9781305578296  
 College Level: Yes  
 Flesch-Kincaid reading level: 11.1
7. Entrance Skills: *Before entering the course students must be able:*
  - a.  
Understand basic wiring.
    - ACR 064 - Read electrical diagrams.
    - ACR 064 - Use electrical test equipment.
    - ACR 064 - Troubleshoot electrical circuit.
    - ACR 064 - Demonstrate an understanding of basic theory behind electrical and electronic components.
8. Course Content and Scope:

## Lecture:

- a. Intro to Gas Heating
  - i. Heat
  - ii. Molecules, heat and temperature
  - iii. Heat transfer
  - iv. Pressure
- b. Principles of Gas Combustion
  - i. Gas Properties
  - ii. Combustion Theory
  - iii. Practical Combustion
  - iv. Efficiency
- c. Gas Furnaces
  - i. Furnace Design
  - ii. Gas System Components
  - iii. Furnace Controls
  - iv. System Controls and Components
- d. Gas Burners
  - i. Theoretical Flame Characteristics
  - ii. Burning Design
  - iii. Actual Flame Characteristics
  - iv. Combustion Systems
  - v. Pilot Burners
- e. Gas Controls
  - i. Gas Pressure Regulators
  - ii. Gas Values
  - iii. Automatic Combination Gas Values
  - iv. Troubleshooting
- f. Ventilation and venting

Lab: *(if the "Lab Hours" is greater than zero this is required)*

1. Gas controls
2. Pilot and flame safeties
3. Sequence of operation
4. Safe and efficient operation
5. Service and Maintenance
6. Venting
7. Troubleshooting
8. Heat rise Verification
9. setting gas valve for proper w.c.
10. Combustion analysing

## 9. Course Student Learning Outcomes:

1. Explain the sequence of operation of natural and LP gas heating systems,
2. Describe the function of gas controls, gas combustion, flame characteristics, burner design, controls, and ignition systems
3. Gather critical information from gas heating systems to make informed decisions about their safe and efficient operation.
4. Use gathered information to adjust, repair and maintain residential gas heating systems.

## 10. Course Objectives: *Upon completion of this course, students will be able to:*

- a. Describe the operation and practical application of each accessory device as listed in the course content.
- b. Demonstrate an understanding of the installation procedures for each of the accessory device described.
- c. Explain basic adjustment and service procedures on each device described.
- d. Determine feasibility of installing a device to an existing system and be aware of sizing and selection procedures necessary to properly select the device for a particular system.

## 11. Methods of Instruction: *(Integration: Elements should validate parallel course outline elements)*

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- a. Demonstration, Repetition/Practice
- b. Laboratory
- c. Lecture
- d. Technology-based instruction

12. Assignments: *(List samples of specific activities/assignments students are expected to complete both in and outside of class.)*

In Class Hours: 72.00

Outside Class Hours: 90.00

a. In-class Assignments

- 1. Class worksheets
- 2. Skill checks
- 3. Group discussions
- 4. EPA Preparation Software

b. Out-of-class Assignments

- 1. Read industry magazine articles and present information to class
- 2. Answer review questions at end of each assigned unit
- 3. Maintain notebook of hand-outs and class notes
- 4. Read unit assignments
- 5. Use internet to search for assigned subject material
- 6. EPA Preparation Software

13. Methods of Evaluating Student Progress: *The student will demonstrate proficiency by:*

- Written homework
- Laboratory projects
- Presentations/student demonstration observations
- True/false/multiple choice examinations
- Mid-term and final evaluations
- Student participation/contribution

14. Methods of Evaluating: Additional Assessment Information:

15. Need/Purpose/Rationale -- *All courses must meet one or more CCC missions.*

PO - Career and Technical Education

Apply critical thinking skills to execute daily duties in their area of employment.

IO - Critical Thinking and Communication

Apply principles of logic to problem solve and reason with a fair and open mind.

Summarize, analyze, and interpret oral and written texts, with the ability to identify assumptions and differentiate fact from opinion.

16. Comparable Transfer Course

**University System**

**Campus**

**Course Number**

**Course Title**

**Catalog Year**

17. Special Materials and/or Equipment Required of Students:

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18. Materials Fees:  Required Material?

**Material or Item**

**Cost Per Unit**

**Total Cost**

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19. Provide Reasons for the Substantial Modifications or New Course:

Periodic review

20. a. Cross-Listed Course (*Enter Course Code*): N/A  
b. Replacement Course (*Enter original Course Code*): N/A

21. Grading Method (*choose one*): Letter Grade Only

22. MIS Course Data Elements

- a. Course Control Number [CB00]: CCC000513171  
b. T.O.P. Code [CB03]: 94600.00 - Environmental Control Tec  
c. Credit Status [CB04]: D - Credit - Degree Applicable  
d. Course Transfer Status [CB05]: C = Non-Transferable  
e. Basic Skills Status [CB08]: 2N = Not basic skills course  
f. Vocational Status [CB09]: Clearly Occupational  
g. Course Classification [CB11]: Y - Credit Course  
h. Special Class Status [CB13]: N - Not Special  
i. Course CAN Code [CB14]: N/A  
j. Course Prior to College Level [CB21]: Y = Not Applicable  
k. Course Noncredit Category [CB22]: Y - Not Applicable  
l. Funding Agency Category [CB23]: Y = Not Applicable  
m. Program Status [CB24]: 1 = Program Applicable

Name of Approved Program (*if program-applicable*): AIR CONDITIONING AND REFRIGERATION,AIR  
CONDITIONING AND REFRIGERATION

*Attach listings of Degree and/or Certificate Programs showing this course as a required or a restricted elective.)*

23. Enrollment - Estimate Enrollment

First Year: 30  
Third Year: 30

24. Resources - Faculty - Discipline and Other Qualifications:

- a. Sufficient Faculty Resources: Yes  
b. If No, list number of FTE needed to offer this course: N/A

25. Additional Equipment and/or Supplies Needed and Source of Funding.

N/A

26. Additional Construction or Modification of Existing Classroom Space Needed. (*Explain:*)

N/A

27. FOR NEW OR SUBSTANTIALLY MODIFIED COURSES

Library and/or Learning Resources Present in the Collection are Sufficient to Meet the Need of the Students Enrolled in the Course: Yes

1. John Tomczyk; Eugene Silberstein, B.A., M.S., BEAP, CMHE; Bill Whitman; Bill Johnson. *Refrigeration Air Conditioning Technology*, 8th ed. Boston, MA 02210: Cengage Learning, 2017, ISBN: 9781305578296.

28. Originator George Brown Origination Date 03/31/16