**Course Description:**
A study of procedures and principles used in servicing heating systems, including gas fired and electric furnaces. The student will be introduced to proper testing and troubleshooting techniques. The class will cover proper wiring, gas controls, thermostats, spark ignition, and venting procedures.

**Prerequisites:** HART 1401 or consent of instructor.

**Text, References, and Supplies:**
1. *Modern Refrigeration and Air Conditioning* With E Resources from Book Store
2. Industry Literature

**Course Goals/Objectives:**
This course will focus on the skills needed to perform maintenance and service for heating equipment. The student will learn the principles and components of heating equipment, including gas heat and electric heat. This course will stress application of skills in many lab exercises. The following list of course goals will be addressed in the course. These goals are directly related to the performance objectives.

(* designates a CRUCIAL Goal)

1. Display *work habits.*
2. Use *safe work habits.*
3. Explain *combustion.*
4. Define *complete* combustion.
5. Define *incomplete* combustion.
6. Explain *combustion testing.*
7. Describe *heating fuels.*
8. List *furnace components*
9. Calculate gas furnace *BTU output.*
10. Explain *outside combustion* air requirements.
11. Explain *primary air combustion* requirements.
12. List three *thermostat types.*
13. Explain *multi-stage thermostats.*
14. Explain *cooling anticipator operation.*
15. Explain *heating anticipator operation.*
16. Use amp meter.
17. Use volt meter.
18. Measure anticipator current.
20. Calculate gas furnace CFM.
21. Explain gas piping requirements.
*22. Explain standard furnace venting requirements.
23. Test gas furnace efficiency.
24. Measure temperature rise.
25. Clean burner chamber.
27. Explain electric heat only thermostat.
29. Explain spark ignition systems.
30. Explain burner orifice sizing.
31. Explain combustion air requirements.
32. Explain gas furnace safety controls.
33. Trace gas heat schematic diagram.
34. Identify gas furnace components.
* 35. Identify LP gas pressure requirements.
* 36. Identify natural gas pressure requirements.
37. Measure supply gas pressure.
* 38. Measure manifold gas pressure.
39. Adjust gas pressure.
40. Adjust burner flame.
41. Analyze types of flames.
42. Test pilot safety.
43. Test fan control.
44. Test limit safety.
* 45. Inspect heat exchanger.
46. Test flue draft.
47. Troubleshoot gas furnace.
48. Perform gas heat pre-season maintenance.
49. Read gas heat schematics.
50. Install gas valve.
51. Install fan control.
52. Explain 80+ furnace venting requirements.
53. Explain secondary heat exchanger function.
54. Explain pulse furnace operation.
* 55. Explain pulse furnace venting requirements.
56. Identify electric heat components.
57. Calculate electric furnace BTU output.
58. Calculate electric furnace CFM.
59. Draw electric heat schematic.
60. Explain fusible link function.
61. Trace electric heat schematic diagram.
62. Write electric furnace operational sequence.
63. Test electric heat strip.
64. Test electric heat sequencer.

Student Contributions and Class Policies:

Each student will spend at least 4 hours per week preparing for class. As a student in this class you are expected to display respect, professional behavior and a cooperative attitude at all times. Punctual attendance is critical in this class. This course will focus on the basic skills needed to perform in the field as a beginning service technician. The student will learn how to use meters and test instruments, how to apply these test instruments to troubleshoot simple electrical problems.

Evaluation of Students:

<table>
<thead>
<tr>
<th>Component</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab</td>
<td>30%</td>
</tr>
<tr>
<td>Quizzes &amp; Homework</td>
<td>25%</td>
</tr>
<tr>
<td>Attitude &amp; Attendance</td>
<td>20%</td>
</tr>
<tr>
<td>Final Examination</td>
<td>25%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Course Schedule:

The class meets for 6 lecture hours and 6 lab hours per week for 8 weeks.

AMERICANS WITH DISABILITIES ACT (ADA):

Any student who, because of a disabling condition, may require some special arrangements in order to meet course requirements should contact Shep Grinnan as soon as possible. Mr. Grinnan’s office is located in the Scharbauer Student Center Building. These conditions may include documented physical or educational disabilities. Please be aware that services or accommodations are not automatic. Each student must request them and secure the proper authorizations/documentation.
SCANS Information: The following SCANS skills will be taught and/or reinforced in this course.

SYSTEMS: Suggests modifications to existing systems and develops new or alternative systems to improve performance. Knows how technological systems work and operates effectively with them.

TECHNOLOGY: Chooses procedures, tools or equipment including computers and related technologies. Prevents, identifies, or solves problems with equipment.

Safety Glass Policy: It is required that all persons in the Air Conditioning Program wear eye protection while in the lab. Students are required to furnish their own protection. Visitors will be supplied with a pair of glasses to be used during their visit. If you have any questions about this policy, please ask your instructor to clarify them for you.

Instructor Information: Jaroy Roberts, Instructor
Room 187 TC
(432) 685-4687 Office
(432) 349-5913 cell
E-Mail: jroberts@midland.edu

Office Hours: Posted

Curt Pervier, Applied Technology Dean
Lisa Tanner, Applied Technology Secretary
Room 143A TC
(432) 685-4676
Fax: (432) 685-6472

Students are encouraged to contact the instructor at any time; however, making an appointment will guarantee the instructor’s availability at a specific time.