COURSE OUTLINE

ACHP171 – HEATING AND PLUMBING PRINCIPLES AND PRACTICES 1

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SCHOOL OF ENGINEERING TECHNOLOGY

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A. **TITLE:** Heating and Plumbing Principles and Practices 1

B. **COURSE NUMBER:** ACHP171  
**SHORT TITLE** Heating and Plumbing

C. **CREDIT HOURS:** 7

D. **WRITING INTENSIVE COURSE:** (OPTIONAL) No

E. **LENGTH OF COURSE:** 15 weeks (including final)

F. **SEMESTER(S) OFFERED:** Fall

G. **HOURS OF LECTURE:** 4 hrs. of lecture per week.  
9 hrs. of lab per week.

H. **CATALOGUE DESCRIPTION:** The fundamentals of heating equipment and practices; selection, use and care of hand and power tools; piping fabrication of copper, steel, cast iron and plastic pipe; oil burner installation and service; drainage, waste and vent plumbing; basic sheet metal practice; well pumps and accessories.

I. **PRE-REQUISITES:** None  
**CO-COURSES:** MATH 101 or 106, ENGL 101, and CONS 151

J. **GOALS (STUDENT LEARNING OUTCOMES):**  
By the end of the course, the student should be able to:

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<th>Course Objective</th>
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| Install a half bathroom using proper practices in a group setting | 3. Professional competence  
4. Inter/Intra personal skills |
| Install a functional single zone oil boiler in a group setting | 3. Professional competence  
4. Inter/Intra personal skills |
| Show proper usage of hand and power threading tools | 3. Professional competence |
| Flare and solder copper pipe and tubing               | 3. Professional competence             |
| Create basic sheet metal objects                      | 3. Professional competence             |
| Design proper DWV and supply water systems            | 2. Critical thinking  
3. Professional competence                         |
K. **TEXTBOOK:** Residential Construction Academy: Plumbing
   Residential Construction Academy: Heating
   Sheet Metal
   ACHP171 Lab and Reference Manual

L. **REFERENCES:** Manufacturer installation and service manuals, ASHRAE Fundamentals.

M. **EQUIPMENT:** Various heating and plumbing equipment, combustion analyzer, velometer, multimeter, ammeter and monometer.

N. **GRADING METHOD:** (P/F, A-F, etc.): A-F.

O. **MEASUREMENT CRITERIA/METHODS:** One half of grade will come from completed lab projects. One half of grade will come from lecture quizzes and exams.

P. **DETAILED TOPICAL OUTLINE:**
   1. Layout and installation of half-bathroom
      a. Select proper location of DWV and supply piping;
      b. Install leak-free fixtures;
      c. Provide a detailed material list.
   2. Replacing fixtures
      a. Diagnostic check of existing fixture reliability;
      d. Understanding and applying manufacturer data sheets for fixture replacement;
      e. Job cost estimating.
   3. Water heater installation and service
      f. Calculating hot water demand;
      g. Sizing of gas, oil or electrical supply lines;
      h. Determining flue connections as required;
      i. Use of multimeter and manufacturer wiring diagrams for troubleshooting.
   4. Sheet metal pattern drafting and fabrication
      j. Basic sheet metal patterns;
      k. Construction of at least (2) sheet metal projects;
      l. Demonstrate ability with sheet metal tools.
   5. Oil fired equipment controls
      m. Ignition transformers;
      n. Primary Controls;
      o. Cad cell sensors;
      p. Fan and limit control.
   6. Hydronic system installation
q. Boiler and sundry installation;
 r. Fuel and flue sizing;
s. Supply and return piping sizing for a single zone;
t. Combustion efficiency calculation;
u. Complete material list.

7. Well pump installation
   v. Shallow well, single pipe;
   w. Shallow well, (2) pipe;
x. Submersible pumps;
y. Determining pump efficiency.

Q. LABORATORY OUTLINE:
1. Design and install a half-bath
2. Design and install a single zone oil boiler system.
3. Install an oil, gas or electric water heater.
4. Post-job estimate and job cost out for above 3 installations.
5. Combustion testing and troubleshooting on 3 lab units.
6. Electrical testing and multimeter usage on lab breadboards.
7. Sheet metal pattern drafting and fabrication, using basic methods.
8. Testing and inspecting plumbing systems;
9. Replacing fixtures;
10. Water heater installation and service;
11. Sheet metal pattern drafting and fabrication;
12. Oil fired equipment controls;
13. Hydronic system installation;