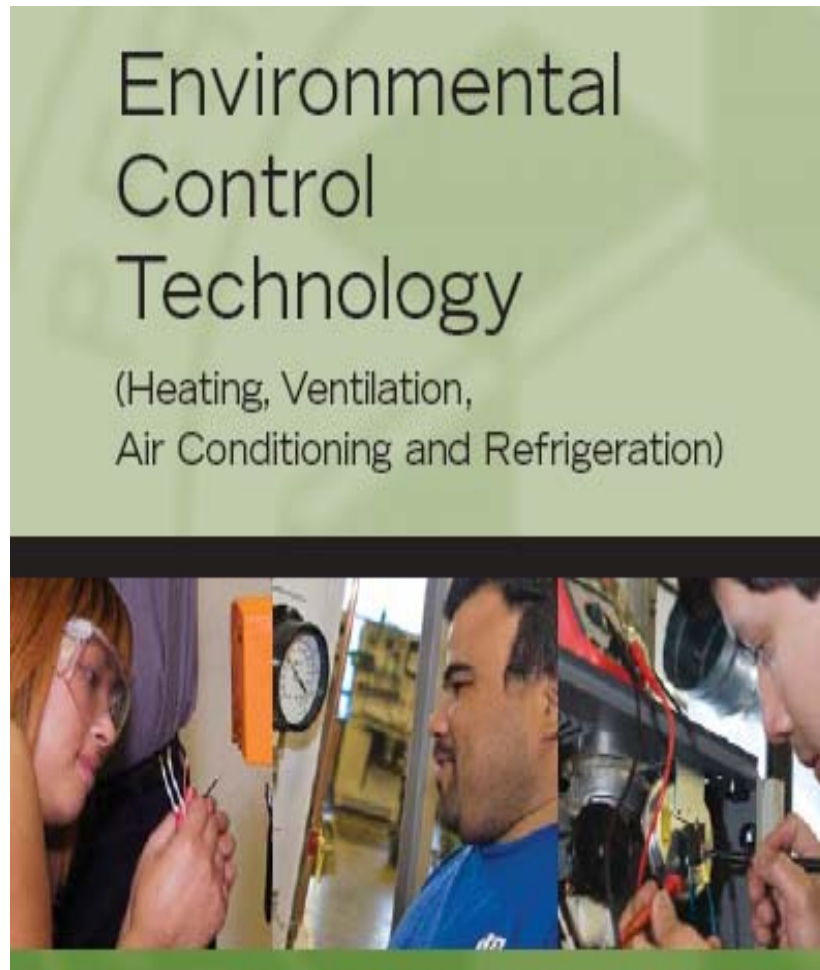


# PROBLEM BASED LEARNING



## ECT 24: Commercial HVAC Systems

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## **PROBLEM BASED LEARNING (PBL) SCENARIO**

**Instructor:** Chuck Frost

**Course:** Commercial HVAC Systems

**Course Number/Code:** ECT 24

### **SCENARIO TITLE**

“How to Keep the Chiller Running”

### **Key Course Concepts:**

- Demonstrate the ability to understand the Heating, Ventilation, Air Conditioning (HVAC) system of buildings and the thermodynamics of heat transfer.

### **SCENARIO DURATION**

- **2 partial class periods:** An introduction to the Problem Based Learning (PBL) process, presentation of sample projects, and class time to work on the project as a group

### **BUSINESS PARTNER**

Laney College, Environmental Control Technology (ECT)

### **LEARNING OBJECTIVES**

By the end of the semester, students will be able to demonstrate the ability to:

- Understand the HVAC system of buildings
- Calculate the amount of heat transfer
- Interpret and extract information from trend data and design documents

### **THE FOCUS OF THE PROBLEM**

The focus of this Problem Based Learning (PBL) scenario is based around a real life scenario.

In various settings, the Problem Based Learning (PBL) scenario may be presented as a real time problem, hands-on scenario, or hypothetical problem. Using critical thinking and investigation, the students go through a process to solve a problem and provide recommendations for a solution.

### **PROBLEMATIC SITUATION**

At the University of California, Berkeley, there is an 8 story building with a science laboratory in the basement. The building was undergoing a major infrastructure remodeling. In November, the nighttime outdoor temperature dropped into the high 30°F. This created problems for the chiller that was needed to supply water to keep the experiment running.

As a group, it your job to identify how to put enough BTUs on the chiller to keep it running in order to continue a long term Physics Department experiment and prevent critical data from being lost.

Questions to think about while investigating the Problem Based Learning (PBL) scenario:

***WHO*** is involved?

***WHAT*** is not working?

***WHEN*** did the problem start?

***WHERE*** is this scenario taking place?

***TIME*** pressures or deadlines?

### **STUDENT MATERIALS**

The instructor will provide students with the following information:

- A copy of the Problem Based Learning (PBL) cycle and steps
- An explanation of the Problem Based Learning (PBL) approach
- A brief history of the building remodel
- Images and graphics of the building
- Tool: “Need to Know” to gather information
- Tool: Scoring rubric for final presentation
- Problem Based Learning (PBL) scenario evaluations: Team evaluation and online survey

### **Resources and Media:**

- The internet
- Educational materials and books

### **INSTRUCTOR ROLE**

The instructor will support the Problem Based Learning (PBL) experience by:

- Introducing the scenario and process
- Facilitating reflection and discussion
- Providing applicable resources and materials
- Answering any questions related to the scenario and coursework
- Providing class time to work on the scenario

## **STUDENT ROLE AND GUIDELINES**

### **Individual**

The intended outcome will be measured by having each student:

- Distribute project tasks between the team members
- Perform a specific individual role in their team
- Perform a specific individual role in the final presentation
- Complete a Problem Based Learning (PBL) scenario and team evaluation as a part of the final project

## **STUDENT ROLE AND GUIDELINES**

### **Team**

The intended team outcome will be measured by providing:

- ☐ A team presentation where each student will individually present a particular segment (1-2 minutes) of the recommendations to solve the problem at the University of California Berkeley Physics Department.
- ☐ Turn in an electronic version of your team Power Point Presentation to the instructor.
- ☐ A single document which describes recommendations on the problem and the solution(s).
- ☐ A class discussion where each student on the team will make an oral presentation of what they learned.

### **Group Size:**

- 4 or 5 groups (Approximately 3-5 students per team)
- The Instructor will participate in the selection of members of each team

## **PRESENTATION DATE**

The final presentation date: \_\_\_\_\_ (fill in date)

## **STUDENT FEEDBACK**

As a team, and individually - students will review, assess and provide feedback regarding the Problem Based Learning (PBL) scenario experience.

Requirements of the final project: Before final presentation

- Completion of team member evaluation and online survey

## **TEAM LINK**

The instructor will support the team learning process by allowing:

- Time to meet during class, outside of class and on the phone to work on the scenario

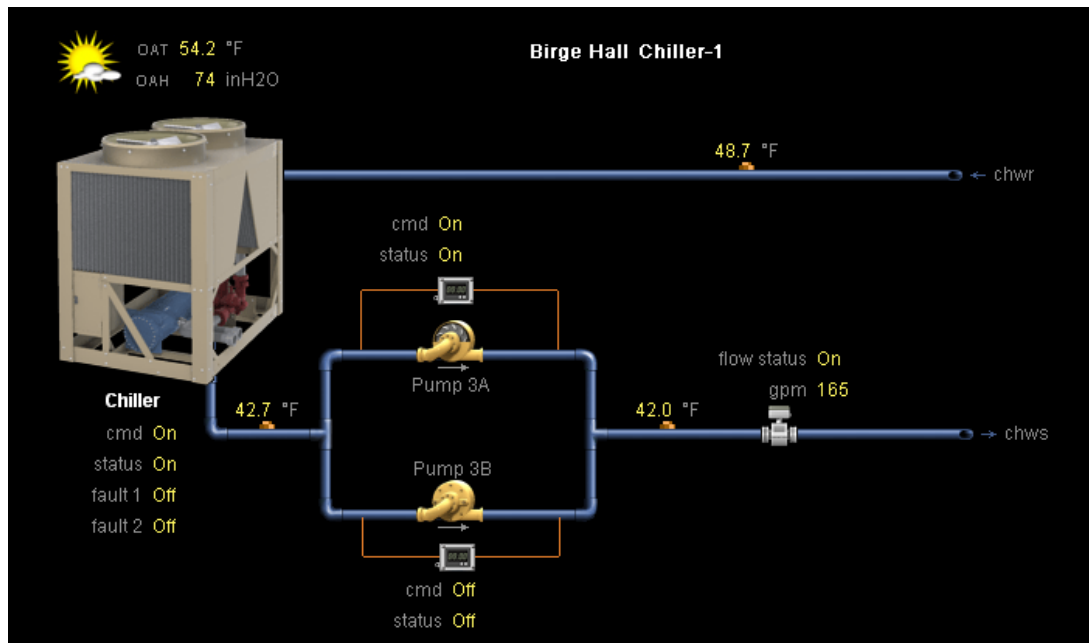


**Photograph: The University of California Berkeley, roof top view of Birge Hall**

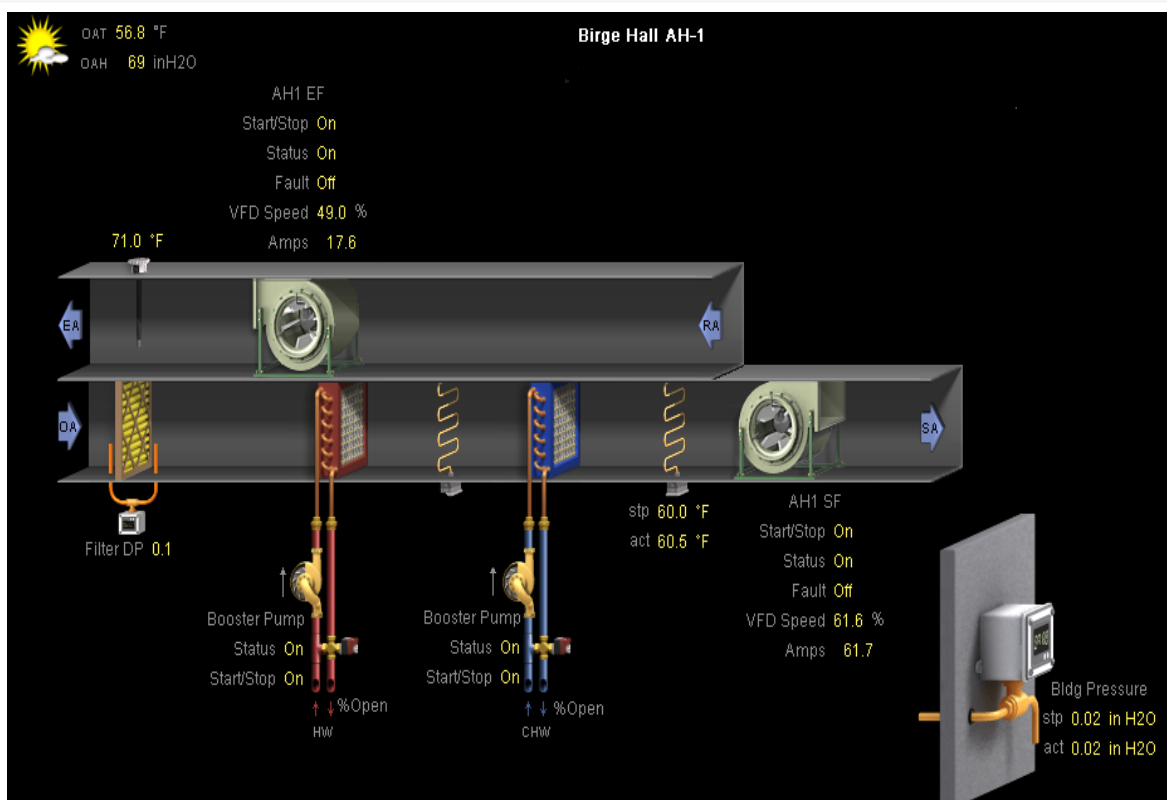




**Screen shot 1, Title: Graphic screen from control system of Birge Hall chiller**



**Screen shot 2, Title: Graphic screen from control system of air handling unit of Birge Hall**



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