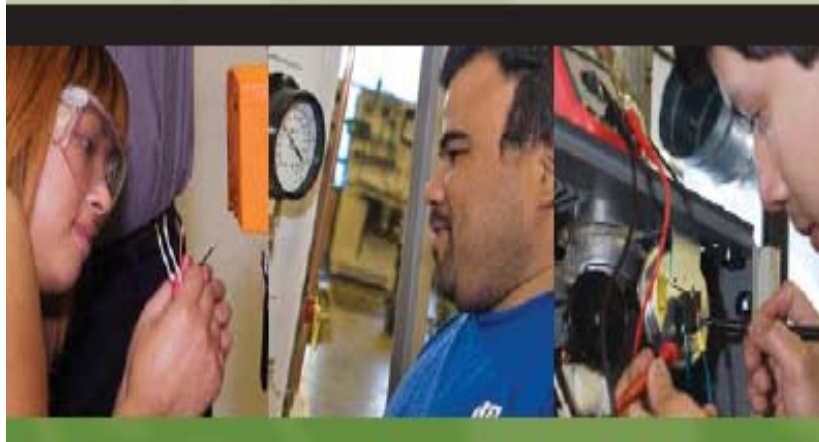




# PROBLEM BASED LEARNING

## Environmental Control Technology

(Heating, Ventilation,  
Air Conditioning and Refrigeration)



### ECT 23: Heating, Ventilation, Air Conditioning System Design

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

**Instructor:** Hadley Hartshorn

**Course:** Heating, Ventilation, Air Conditioning System Design

**Course Number/Code:** ECT 23

### **SCENARIO TITLE**

“Redesign the Air Conditioning Layout for the 7<sup>th</sup> Floor Conference Room”

### **Course Concept:**

Design a small HVAC system (basis of design, drawings, and equipment specifications) for a single commercial zone

### **SCENARIO DURATION**

- **7 class periods:** March 23 to May 11, which include 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:

- Design an air conditioning system that meets the requirements of the client
- Identify the HVAC requirements of a room, select components and prepare a systems layout
- Analyze and assess the design of a given environment and make decisions on what the problems may be
- Document the diagnosis of a problem and present recommendations for repair and improvements

### **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**

Peter is an employee at Laney College and works on the 7<sup>th</sup> floor of the Administration Building. Peter often attends regular meetings in the conference room B170.

While attending various meetings, Peter believes that the conference room has symptoms of a faulty air conditioning system. Peter thinks the conference room has a history of frequent repairs done in a piece meal way. He is suspicious that this could be leading to bad indoor quality in the conference room.

However, Peter is not sure what the exact problem is.

It is your job to document his concerns regarding the existing environmental conditions, current systems, and design history. Your analysis will form a recommendation plan and possible solution(s) that you will propose to Peter regarding his concerns about the conference room.

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 sample RFI document (Request For Information)
- Configuration documents from the District Office
- A sample research document on the design criteria for conference rooms
- Tool: “Need to know board” to gather information
- Tool: Scoring rubric for final presentation
- Tool: Proper Troubleshooting Steps
- Tool: Assessing your team members evaluation
- Problem Based Learning (PBL) scenario evaluation

### **Resources and Media:**

- The internet
- Educational materials and books
- Configuration documents from the District Office

## **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 group 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

<b>Class 1: Interview the client</b>
<p><b>Date:</b></p> <ul style="list-style-type: none"> <li>• <b>Introduction of PBL</b></li> <li>• The group will determine what questions to ask the client, a minimum of 6 questions. Each student will submit at least one question to the group list</li> <li>• Interview the client and gather information</li> </ul>
<b>Class 2: Identify the problem</b>
<p><b>Date:</b></p> <ul style="list-style-type: none"> <li>• Create the group “Project Plan”: Timeline of how to achieve solution and task assignments for each person on the team</li> <li>• Present “Project Plan” to client</li> <li>• Have groups implement “Project Plan”</li> </ul>
<b>Class 3: Document the problem</b>
<p><b>Date:</b></p> <ul style="list-style-type: none"> <li>• The group will analyze the gathered information and document the problem</li> <li>• Turn in Project Plan documents</li> </ul>
<b>Class 4-5 : Select Solution - Design System</b>
<p><b>Date:</b></p> <ul style="list-style-type: none"> <li>• The group will select components and design a new system layout (design drawings, sequence of operations and equipment submittal)</li> </ul>
<b>Class 6: Document the Solution</b>
<p><b>Date:</b></p> <ul style="list-style-type: none"> <li>• The group will prepare design documentation and presentation materials</li> </ul>
<b>Class 7: Present the Solution</b>
<p><b>Date:</b></p> <ul style="list-style-type: none"> <li>• The group will present the final documentation and recommended solution(s) to the client</li> <li>• The class will discuss the solution and insights</li> </ul> <p>*Extra credit will be giving to presentations provided in Power Point</p>



## **STUDENT ROLE AND GUIDELINES**

### **Group**

The intended group outcome will be measured by providing:

- A group presentation where each student will individually present a particular segment (1-2 minutes) of the recommendations to the client
- 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 5-6 students per group)

The Instructor will participate in the selection of members of each group.

### **Presentation Guidelines:**

Problem Based Scenario is 20 points out of 100:

- The project must be completed and final reports must be turned in on or before the day of the presentation which is Tuesday, May 11, 2010
- The project grade will be equivalent to a Midterm, a maximum of 20 points, but extra credit will be given to presentations provided in Power Point

Refer to the “Scoring Rubric for Final Presentation” tool for the key elements of how the final presentation will be graded. Final Presentation is worth 5 out of 20 points.

## **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:

- Completion of a short Problem Based Learning (PBL) questionnaire
- Completion of a short team member evaluation

## **TEAM LINK**

The instructor will support the team learning process by allowing:

- 15-20 minutes approximately every week, where students will be able to work on the scenario as a group
- Time to meet during class, outside of class and on the phone to work on the scenario