

**LANEY COLLEGE**  
**Environmental Control Technology**  
Summer semester

**Course:** Physics for Building Science

**Course Number/code:** ECT 01

**Time:** Monday - Friday 8:30AM – 3:30 PM

**Instructor:** Nick Kyriakopedi, Solomon Obolu

**Office:** B150

**Office Hours:** 3:30 – 4:00PM, Monday - Friday

**Phone:** 510-464-3292

**Units:** 4 units.

**Course Description:** Principles of physics relevant to Environmental Control Technologies: Thermodynamics, electricity and power conversion, properties of light and energy management and efficiency. Emphasis will be on laboratory applications and safe practices for working with chemicals, electrical devices, and compressed gases.

**Student Outcomes:**

1. Demonstrate safety procedures using compressed gases and chemicals and working with electrical systems.
2. Demonstrate understanding of heat transfer and content, heating and cooling systems and equipment.
3. Evaluate factors related to personal comfort related to heating and lighting.
4. Demonstrate understanding of principles of electricity and magnetism, motors and digital sensors.
5. Demonstrate safe and proper copper tubing bending, soldering and brazing practices.
6. Describe electrical energy sources, and relationship to electrical energy demand in buildings.
7. Describe operating principles of heating, cooling and lighting systems.
8. Demonstrate understanding of properties of light.
9. Describe various types of lighting systems.
10. Perform computer modeling of commercial and residential energy-efficiency options.
11. Obtain and analyze data on relation of comfort to heating, cooling and lighting.

**Recommended preparation:** English in reading and writing, basic Math, Computer programming and basic Electricity.

**Text Book:** Louis A. Blumbfield, How Things Work. The Physics of Everyday Life, Second Edition, John Wiley 2001 and Sons, Inc

**Supplies Needed:** Calculator, pencils, safety glasses, gloves, flathead and phillips screwdrivers.

**Lecture:** Chapter 1 thru 18 of the electrical motor controls book will be covered during the semester. The class will concentrate on the following areas:

1. Introduction to Physics and Building Science

2. Basic HVAC&R systems
3. Brazing and Soldering
4. Thermodynamics and Heat Transfer
5. Building envelope and heating and cooling loads
6. Energy auditing
7. Fundamentals of electricity
8. Motors and Electromagnetism
9. Solar systems and alternative energy

**Grading Policy:**

1. Quiz number 1	<b>15%</b>
2. Quiz number 2	<b>15%</b>
3. Quiz number 3	<b>15%</b>
4. Lab and Lecture Participation	<b>10%</b>
5. Laboratory Projects	<b>25%</b>
<b>6. Final Test</b>	<b>20%</b>

**Daily Time Schedule**

Session A	8:30 am to 10:00 am
Session B	10:15 am to 12:00 pm
Lunch	12:00 pm to 12:45 pm
Session C	12:30 pm to 2:00 pm
Session D	2:10 pm to 3:30 pm

**Week 1**      Safety Training  
 Overview of project based learning  
 Mathematics Review  
 Physics Principles and review  
 Simple circuits and lab test  
 Principles of refrigeration

**Week 2**      Heat and Thermodynamics  
 Heat Capacity  
 Thermal Conductivity  
 Principles of Air Conditioning  
 Problem-based learning  
 Introduction to HVAC – on-line problem solving

**Week 3**      Lighting  
 Introduction to properties of light and the electromagnetic spectrum  
 Advanced Studies of lighting in buildings  
 Lighting for Comfort Study  
 Electrical systems, lighting and occupant comfort study

Skills & Techniques in Refrigeration

**Week 4**

Electricity and Magnetism

Physical Principles of Electricity and Magnetism

Motors

Building operation and management in a digital world

Applications of Motors in HVAC Systems

Skills & Techniques in Refrigeration

Heat, temperature and occupant comfort study

**Week 5**

Energy and Power

Introduction to Energy and Power and Energy Conversion (First and Second Laws of Thermodynamics)

Energy Gains and Losses and Conversions in Building

Skills & Techniques in Refrigeration

Energy Services and Costs in Buildings

Refrigeration standards and their impact on energy use in America

Electrical systems, windows lighting and occupant comfort study

## **Course Structure**

- I. Principles of Physics Lab – Solomon Obolu
- II. Applications in Environmental Control Technology – Nick Kryiakopedi
- III. Energy Efficient Buildings – Bruce Douglas

## **Course Instructors**

Solomon Obolu – Instructors of Record, Physics and Electrical Technology (Laney College)

*Nick Kyriakopedi – Instructors of Record, Physics for Environmental Control Technology (Laney College)*

*Bruce Douglas - Instructors of Record, Physics for Environmental Control Technology (Laney College)*

## **Guest Presenters**

*Rich Diamond (LBNL) – Energy Efficiency in Buildings*

Shelly Rosenblum (EPA) – Indoor Air Quality

Ryan Stroup – Lecture and Field Work of Energy Auditing

Andy Wahl – Training Required for Career Path

Patch Garcia – Careers in Building Science

**Attendance:** Students may be dropped from the course if the number of absences exceeds three days worth of class meetings. However, extenuating circumstances may warrant consideration.

**Note:** No cell phones during class time.

**Note:** It is student's responsibility to drop the classes.