

**CUYAMACA COLLEGE**  
**OFFICIAL COURSE OUTLINE**

**WATER/WASTEWATER TECHNOLOGY 106 – INTRODUCTION TO ELECTRICAL AND INSTRUMENTATION PROCESSES**

3 hours lecture, 3 units

**Catalog Description**

Introductory course in basic electron theory and electrical principles. Electrical safety precautions, component identification, schematic interpretation, motors, transformers, relays and test equipment will be studied. Automated process control devices and an overview of current technologies will be discussed.

**Prerequisite**

None

**Course Objectives**

Students will be able to:

- 1) Identify the electrical safety precautions practiced in the electrical/electronic environment
- 2) Identify various electrical/electronic components both physically and through schematic interpretation
- 3) Discuss basic electronic theory and electrical principles, and demonstrate knowledge of motors, transformers, relays and test equipment used in the electrical/electronic field
- 4) Given a reference sheet, identify instrument symbols and instrument identification by association or by labeling
- 5) Identify instruments and control systems both physically and through schematic interpretation
- 6) List and describe the operation of a variety of control systems, sensing and sampling devices

**Special Materials Required of Student**

None

**Minimum Instructional Facilities**

Standard classroom with audiovisual equipment

**Course Content**

- 1) Electrical
  - a. Electrical safety precautions
    1. Cause of electrical shock
    2. Lethal potentials (current and voltage)
    3. Prevention of electrical shock
    4. Action taken in the event of electrical shock
  - b. Electron theory and electrical principles
    1. Magnetism
    2. Induction
    3. Voltage, current, resistance, (Ohm's Law)
    4. Power measurements
    5. D.C. circuits
    6. A.S. circuits
    7. Electrical terms
  - c. Electrical and electronic components
    1. Resistor (fixed and variable)
    2. Capacitor (fixed and variable)
    3. Fuse
    4. Inductor (coil)
    5. Switches
    6. Relay
    7. Transistor
    8. Diode
    9. Silicon controlled rectifies (scr)

10. Transformer
  11. Terminal board and buss bar
  12. Solid state devices
  13. Circuit breakers
  - d. Schematic interpretation
    1. Simple circuit
    2. Complex circuit
    3. Line diagram
    4. Control circuit
  - e. Transformers
    1. Construction
    2. Losses
    3. Load no load conditions
    4. Step up step down
    5. Power
    6. Three-phase
  - f. Relays
    1. Construction
    2. Operation and use
    3. Voltage
    4. Single pole double throw (SPDT)
    5. Double pole double throw (DPDT)
  - g. Motors
    1. Motor theory
    2. DC motors
    3. Compound
    4. Series
    5. Shunt
    6. Single phase
    7. Polyphase
    8. Horsepower
  - h. Test equipment
    1. Multimeter
    2. Clamp-on-ammeter
    3. Vacuum tube voltmeter
    4. Megger
- 2) Instrumentation
- a. Terminology
    1. Definitions
    2. Instrument symbols
    3. Process characteristics
    4. Instrument characteristics
    5. Instrument identification
  - b. Control systems
    1. Process/control
    2. Controls
    3. Types of control
  - c. Sensing and sampling devices
    1. Flow
    2. Pressure
    3. Temperature
    4. Level
    5. Density
    6. Chemical sensing devices
    7. Gas detection
  - d. Readout
    1. Servo operated instruments
    2. Indicators
    3. Recorders
    4. Digital
  - e. Remote control systems

1. Various functions performed
2. Devices used
3. Metering circuits
4. Power supplies
5. Land line
6. Microwave
- f. Current technologies
  1. Computers (micro and mini)
  2. Applications
- g. Specifications and records
  1. Detailed
  2. Performance
  3. Combination
  4. Maintenance
  5. Training
  6. Contracts and service
- h. Field trips
  1. Alvarado water treatment plant
  2. Point Loma wastewater treatment plant

**Method of Instruction**

- 1) Lecture and discussion
- 2) Audiovisual
- 3) Field trips

**Method of Evaluation**

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Projects
- 2) Writing assignments
- 3) Quizzes
- 4) Exams (objective, essay)

**Texts and References**

- 1) Required: Goldberg, J. Fundamentals of Electricity. Prentice-Hall, 2000.
- 2) Supplemental: None