ENGR 101A: ADVANCED MANUFACTURING

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Winter 2024
Units:	5
Hours:	5 lecture per week (60 total per quarter)
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	None
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- Upon completion of the course, students will be able to describe elements and basic troubleshooting of circuits.
- Upon completion of the course, students will be able to read and interpret diagrams for mechanical, gas, and electrical systems.
- Upon completion of the course, students will be able to describe manufacturing concerns and troubleshooting procedures.

Description

This course provides an understanding of industry technology and exposure to advanced manufacturing, pneumatics, electronics, mechatronics, and vacuum systems.

Course Objectives

The student will be able to:

1. Electronics
    a. Describe the basic electrical elements, such as power supplies, components of circuits, and basics of electrical conduction
    b. Explain electrical safety concerns for working with electrical systems
    c. Explain the terms, units, and qualitative properties of voltage, current, resistance, and power, as applied to DC and AC electrical circuits
    d. Use basic measurement tools and methods for voltage, current, and resistance measurements
    e. Identify symbols and connections for components using diagrams
    f. Perform wiring of control circuits working from diagrams
    g. Explain the basic operating principals of programmable logic controllers
    h. Troubleshoot electro-mechanical systems
    i. Understand safety techniques in an industrial environment
2. Chemical/Gas delivery
    a. Understand safety practices
    b. Understand possible chemical reactions
3. Mechatronics
    a. Describe motors and how they work
    b. Present an overview of programmable logic controllers (PLC)
    c. Explain control systems: Open and closed loops
    d. Identify concepts of electro-mechanical systems
    e. Demonstrate the use of various sensors to monitor clean room processes
    f. Troubleshoot electro-mechanical systems
4. Basic vacuum technology
    a. Understand gas kinetic theory
    b. Understand bulk behavior vs. molecular behavior
    c. Use equations to relate gas flow and pumpdown time
    d. Identify vacuum sealing surfaces and basic fittings
    e. Demonstrate ability to read vacuum gauges and different types of gauges
    f. Explain differences in type of vacuum pumps
    g. Understand the importance of leak detection
5. Advanced manufacturing practices
    a. Follow procedures and methods for using tools
    b. Follow procedures for reporting issues
    c. Identify steps in a procedure from diagrams
    d. Identify contact person for various issues
    e. Understand level of urgency needed in various situations
    f. Communicate effectively in various clean room scenarios

Course Content

1. Electronics
    a. Circuit theory
    b. Circuit analysis
    c. Electrical safety concerns for people and equipment
    d. Power supplies
    e. Measurement tools and methods for voltage, current, and resistance measurements
    f. Diagrams
    g. Programmable logic controllers
    h. Troubleshooting
2. Chemical/Gas delivery
    a. Safety practices
    b. Chemical reactions
3. Mechatronics
    a. Motors
    b. Programmable logic controllers (PLC)
    c. Control systems: Open and closed loops
    d. Electro-mechanical systems
    e. Sensors
    f. Troubleshooting
4. Basic vacuum technology
    a. Gas kinetic theory
    b. Bulk behavior vs. molecular behavior
    c. Gas flow and pumpdown time equations
    d. Vacuum hardware
    e. Vacuum gauges
    f. Vacuum pumps
    g. Leak detection
5. Advanced manufacturing practices

a. Procedures and methods for using tools
b. Procedures for reporting issues
c. Read and interpret diagrams
d. Reporting procedures
e. Effective communication

Lab Content

Not applicable.

Special Facilities and/or Equipment

None

Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

Written assignments
Oral presentations
Demonstration of hands-on skills

Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lecture
Small group and large group discussion
Projects

Representative Text(s) and Other Materials

Moore, Davis, and Coplan. Building Scientific Apparatus. 2012.

This text is on its 4th edition, when the next edition is published, we will adopt it.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

Reading may include instruction and maintenance manuals, diagrams and flow charts, and operating instructions.

Discipline(s)

Engineering