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

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:

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

Course Content

a. Electronics
   i. Circuit theory
   ii. Circuit analysis
   iii. Electrical safety concerns for people and equipment
   iv. Power supplies
   v. Measurement tools and methods for voltage, current, and resistance measurements
   vi. Diagrams
   vii. Programmable logic controllers
   viii. Troubleshooting
b. Chemical/Gas delivery
   i. Safety practices
   ii. Chemical reactions
c. Mechatronics
   i. Motors
   ii. Programmable logic controllers (PLC)
   iii. Control systems: Open and closed loops
   iv. Electro-mechanical systems
   v. Sensors
   vi. Troubleshooting
d. Basic vacuum technology
   i. Gas kinetic theory
   ii. Bulk behavior vs. molecular behavior
   iii. Gas flow and pumpdown time equations
   iv. Vacuum hardware
   v. Vacuum gauges
   vi. Vacuum pumps
   vii. Leak detection
e. Advanced manufacturing practices
   i. Procedures and methods for using tools
   ii. Procedures for reporting issues
   iii. Read and interpret diagrams
   iv. Reporting procedures
   v. 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