

# ENGR F101A: ADVANCED MANUFACTURING

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## Foothill College

### Approved Course Outline of Record

#### Course Status: Active

#### Effective Term

Winter 2024

#### Subject

Engineering (ENGR)

#### Course Number

F101A

#### Division

Science Technology Engineering and Mathematics (1PS)

#### Units

5

#### Course Title

ADVANCED MANUFACTURING

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#### Weekly Lecture Hours

5

#### Weekly Lab Hours

0

#### Weekly Out of Class Hours

10

#### Total Contact Hours

60

#### Total Student Learning Hours

180

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#### Repeatability Statement

Not Repeatable

#### Credit Status

Credit

#### Degree Status

Applicable

#### Grading

Letter Grade (Request for Pass/No Pass)

**Will credit by exam be allowed for this course?**

No

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**Degree or Certificate Requirement**

None of the above (Stand Alone course)

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**Need/Justification**

This course is important for industry and the Semiconductor Technician apprenticeship program and will be included in the certificate of achievement for the apprenticeship program.

**Course 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

**Methods of Evaluation**

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

Written assignments

Oral presentations

Demonstration of hands-on skills

**Methods 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)**

Author(s)	Title	Publication Date
Moore, Davis, and Coplan	Building Scientific Apparatus	2012

**Please provide justification for any texts that are older than 5 years**

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.

**Authorized Discipline(s):**

Engineering

**Taxonomy of Program Code (TOP Code)**

\*0945.00 - Industrial Systems Technology and Maintenance

**Transferability**

None

**Seat Count**

35