Arkansas CTE

Pre-Mechatronics: Grades 10, 11, 12

Adopted 2015

Identify and demonstrate understanding of industrial equipment maintenance and mechatronics.

1.1 Demonstrate an understanding of mechatronics and industrial equipment maintenance crafts.

1. Describe the types of work performed by industrial maintenance and mechatronics craft workers. 1.1.1
2. Identify career opportunities available to industrial maintenance and mechatronics craft workers. 1.1.2
3. Explain the purpose and objectives of an apprenticeship training program. 1.1.3
4. Explain the responsibilities and characteristics of a good industrial maintenance and mechatronics craft worker. 1.1.4
5. Explain the importance of safety in relation to industrial maintenance and mechatronics craft workers. 1.1.5
6. Explain the role of NCCER in the training process. 1.1.6
7. Explain how mechatronics is the integration of multiple disciplines in industrial process. 1.1.7
8. Describe the flow of electrical and mechanical energy in a mechanical system. 1.1.8

1.2 Explain the inter-relationships of components and modules within a complex mechatronic system.

1. Trace the historical development of the four facets (mechanical systems, electronic systems, computer systems, and control systems) of a mechatronic system. 1.2.1
2. Demonstrate understanding of the specific role of various mechanical components in mechatronic systems, discerning in a system schematic the effects of various design parameters. 1.2.2
3. Describe the necessary steps to plan, execute, and control a mechatronic system. 1.2.3
4. Explain how mechatronics is the integration of multiple disciplines in industrial processes. 1.2.4
5. Identify major application areas for mechatronics. 1.2.5

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1.3 The student will demonstrate an understanding of the National Electric Code®.

1. Explain the purpose of the National Electrical Code® (NEC®). 1.3.1
2. Describe the layout of the NEC®. 1.3.2
3. Explain how to navigate the NEC®. 1.3.3
4. Describe the purpose of the National Electrical Manufacturers' Association (NEMA) and the National Electric Code. 1.3.4
5. Explain the role of testing laboratories. 1.3.5

Identify and demonstrate an understanding of the tools used in manufacturing and electronics.

2.1 The student will demonstrate an understanding of tools of the trade.

1. Explain the purpose of each of the tools commonly used by industrial maintenance and mechatronics workers. 2.1.1
2. Describe how to maintain each of the tools used by industrial maintenance and mechatronics craft workers. 2.1.2
3. Demonstrate the proper use and basic maintenance of selected industrial maintenance and mechatronics tools. 2.1.3

2.2 The student will demonstrate an understanding of fasteners and anchors.

1. Identify and explain the use of threaded fasteners. 2.2.1
2. Identify and explain the use of non-threaded fasteners. 2.2.2
3. Identify and explain the use of anchors. 2.2.3
4. Select the correct fasteners and anchors for given applications. 2.2.4

2.3 The student will demonstrate an understanding of test equipment.

1. Explain the operation of and describe the following pieces of test equipment:
Tachometer
Pyrometers
Multimeters
Automated diagnostics tools
Wiggy® voltage tester
Stroboscope 2.3.1
2. Explain how to read and convert from one scale to another using the above test equipment. 2.3.2
3. Define frequency and explain the use of a frequency meter. 2.3.3

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Demonstrate an understanding of health and safety procedures in a manufacturing environment.

3.1 Understand Occupational Safety and Health Administration (OSHA) safety rules.

1. Explain the necessity for electrical, mechanical and industrial safety rules. 3.1.1
2. Demonstrate understanding of Material Safety Data Sheets and the right-to-know laws. 3.1.2
3. Identify proper ventilation, grounding, clothing, and communication requirements. 3.1.3
4. Identify industrial safety codes, standards and regulations. 3.1.4
5. Explain OSHA hazard communication as pertaining to lubrication. Read and interpret a material data safety sheet (MSDS). 3.1.5
6. Explain the EPA hazardous waste control program. 3.1.6

3.2 Apply safety procedures of electronic instruments.

1. Demonstrate appropriate use of tools and equipment. 3.2.1
2. Explain fire prevention and extinguishing of mechanical and electrical fires. 3.2.2
3. Demonstrate knowledge of communicating safety violations. 3.2.3
4. Identify procedures for emergency evacuations. 3.2.4
5. Identify causes of accidents and the impact of employee accidents on the employer and industry. 3.2.5
6. Identify basic crane, forklift and loading safety procedures. 3.2.6

Identify and demonstrate an understanding of craft-related mathematics and blueprints

4.1 The student will demonstrate an understanding of craft-related mathematics and schematic diagrams.

1. Identify and explain the use of special measuring devices. 4.1.1
2. Explain the basic layout of a mechanical or electrical diagram. 4.1.2
3. Identify common symbols used on a diagram legend. 4.2.3
4. Analyze basic mechatronic blueprints. 4.2.4

Identify and demonstrate an understanding of mechanical components and systems.

5.1 The student will demonstrate an understanding of pumps and valves.

1. Identify and explain centrifugal pumps, rotary pumps, reciprocating pumps, metering pumps and vacuum pumps. 5.1.1
2. Explain net positive suction head and cavitation. 5.1.2
3. Identify types of drivers. 5.1.3
4. Identify types of valves that start and stop flow, valves that regulate flow, valves that relieve pressure and valves that regulate the direction of flow. 5.1.4
5. Explain valve locations and positions to properly store and handles. 5.1.5

5.2 Demonstrate an understanding of gaskets and packing materials.

1. Identify the various types of gaskets and explain their uses. 5.2.1

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2. Identify the various types of gasket materials and explain their applications. 5.2.2
3. Describe the use of O-rings. 5.2.3
4. Explain the importance of selecting the correct O-ring for an application. 5.2.4

5.3 Demonstrate an understanding of lubrication materials and processes.

1. Explain lubricant storage, classification, film protection, properties of lubricants, properties of greases, how to select lubricants. 5.3.1
2. Identify and explain types of additives and of lubricating oils. 5.3.2
3. Read and interpret a lubrication chart. 5.3.3

5.4 Demonstrate an understanding of material handling, rigging, and support equipment.

1. Identify and describe the uses of common rigging hardware and equipment. 5.4.1
2. State the safety precautions associated with the use of motor-driven equipment in industrial plants. 5.4.2
3. Explain the operation and applications of the following motor-driven equipment commonly used in industrial plants. 5.4.3

5.5 The student will demonstrate an understanding of oxyfuel cutting processes.

1. Identify and explain the use of oxyfuel cutting equipment. 5.5.1
2. State the safety precautions for using oxyfuel equipment. 5.5.2

Analyze education and career related opportunities.

6.1 Investigate occupations in manufacturing processes that rely on electromechanical principles and technologies.

1. Demonstrate an understanding of career opportunities and requirements in the field of mechatronics. 6.1.1
2. Discuss individual interests related to a career in electronics technology. 6.1.2
3. Determine knowledge, skills and abilities required for careers in mechatronics. 6.1.3

6.2 Explore education and training opportunities related to a career in the mechatronics pathway.

1. Develop a career plan with alternatives with multiple exit points to include stackable credentials. 6.2.1
2. Develop a career ladder including education programs, extended learning opportunities, foundation work plans and career goals. 6.2.2

6.3 Develop employability skills to secure and keep employment in chosen field.

1. Conduct a job search for possible career opportunities to determine industries, locations, and job opportunities. 6.3.1

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2. Complete a job application form correctly. 6.3.2
3. Develop a career portfolio including examples of work, awards, letters of recommendation and recognition. 6.3.3