Tennessee CTE

Mechatronics I

Mechatronics Overview	1	Drawing on various media, including visual, quantitative, and written resources, trace the historical development of the four facets (mechanical systems, electronic systems, computers, and control systems) of a mechatronic system and explain their chief applications in modern society, citing specific textual evidence. 1
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Safety	3	Accurately read and interpret safety rules, including but not limited to rules pertaining to electrical safety, Occupational Safety and Health Administration (OSHA), state and national code requirements. Apply them accordingly while working on electrical and mechanical components and explain why certain rules apply. 3
Electronics	4	Demonstrate understanding of the specific roles of various electrical components discerned in a circuit schematic by correctly predicting the effects of changing selected parameter values. For example, predict the effect of halving a resistor's value. Compare and contrast these roles and explain how electronic designs vary within a given system or module. 4
	5	Create, measure, and analyze basic director current (DC) circuits prescribed by schematics using Ohm's law, Kirchhoff's law, and Watt's law to predict and verify circuit behavior. Apply understanding of these laws to troubleshoot simple circuits, and document the steps required to remedy the trouble. 5
	6	Create, measure, and analyze circuits prescribed by schematics to predict and verify the behavior of series versus parallel DC circuits or resistances. Where unexpected behavior is observed, cite specific evidence to explain the observations. 6
	7	Using technical documentation, such as manuals and schematics, craft an informative narrative to explain the physical operation of electromagnetic and electrostatic components (such as coils, solenoids, relays, and various sensors) in mechatronic system. Interpret resolved work orders by analyzing underlying ssues and explaining the correct physical operation of the included omponents. 7

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8 **Create, measure, and analyze circuits prescribed by schematics to predict and verify the behavior of the electrical and physical properties of components (such as resistors, capacitors, diodes, transformers, relays, and power supplies). Report findings explaining the typical application and operation in circuits of the previously listed components, citing measurement and/or observed evidence supporting the explanation.** 8

Mechanical

9 **Demonstrate understanding of the specific role of various mechanical components in mechatronic systems, discerning in a system schematic the effects of various design parameters on the system behavior. For example, predict the effect of a larger gear size. Compare and contrast these roles in the context of mechatronic systems, modules, and subsystems, explaining how designs vary within a given system or module.** 9

10 **Create, measure, and analyze mechanical systems prescribed by drawings to predict and verify the behavior of the physical operation of components in a mechatronic system, including but not limited to:** 10

- a Springs, and spring-like effects 10.A
- b Dampers and energy dissipation 10.B
- c Masses (weights) 10.C

Craft an explanatory narrative to report findings and outline the typical application in systems of the components listed above, citing the observed behavior to support explanations.

11 **Interpret technical information in design problems to analyze forces, speeds, torque, and power, for mechanical drives including:** 11

- a Gears, cams, screws, and levers 11.A
- b Belt and chain drives 11.B
- c Flywheels 11.C
- d Motors and generators 11.D

Explain the typical application and operation in systems of the components listed above, citing measurement and/or observed evidence to support explanations. Create equations that describe relationships to solve the design problems and justify the solutions.

12 **Research and measure the behavior of different types of alternating current (AC) motors and direct current (DC) motors, comparing and contrasting behaviors and drawing inferences from the observations to create a checklist for use by a technician to ensure proper functioning of equipment.** 12

13 **Referencing appropriate technical documents (such as data sheets, timing diagrams, operating manuals, and schematics), design an experiment to observe and measure the mechanical properties and behavior of shafts, couplings, and**

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	sealing devices with and without proper lubrication. Document research and measurement results in a technical report to be used by other technicians. 13
	14 Demonstrate understanding of power transmission components, such as clutches and brakes, by measuring the operation of working automotive equipment. Create a graphic illustration showing the roles of each component and how they work together in a system. 14
	15 Assess the required maintenance for a variety of mechatronic system components in a mechatronic device, and carry out the necessary adjustments to the system. Document and justify the adjustments in an equipment log that can be easily referenced by technicians and engineers. 15
Technical Documentation and Troubleshooting	**16 Consult technical documents (such as data sheets, timing diagrams, operating manuals, and schematics) to assess a mechatronic system and effectively troubleshoot the malfunctions in electrical components. Record and analyze test results and prepare written testing documentation to justify a solution.** 16
	17 Verify by observation and measurement the parts, relationships, and behavior depicted by the technical data sheets for the mechanical and electrical components within a mechatronic system. Use these data sheets to create a training document to instruct a new technician on maintaining and operating these components and drives. 17