SKILLED AND TECHNICAL SCIENCES

Manufacturing Cluster Technical Knowledge and Skills
High School/College MECHATRONICS *Student Checklist*

2	1	N				
				STUDENT:		**DATE:**
2	1	N	CODE	N = Not Exposed to Performance Element, 1 = Progressing with Performance Element, 2 = Mastery of Performance Element		
2	1	N	CODE	**MECHATRONICS ELECTRONICS RECORDING (M.ER)**		
			M.ER.1	*Draw and interpret electronics schematics*		
			M.ER.2	*Record data and design curves and graphs*		
			M.ER.3	*Write reports*		
			M.ER.4	*Maintain test logs*		
			M.ER.5	*Make equipment failure reports*		
			M.ER.6	*Specify and requisition simple electronic components*		
2	1	N	CODE	**MECHATRONICS ELECTRONICS DC CIRCUITS (M.ED)**		
			M.ED.1	*Solve basic algebraic problems as applicable to electronics*		
			M.ED.2	*Relate electricity to nature of matter*		
			M.ED.3	*Identify sources of electricity*		
			M.ED.4	*Define voltage, current, resistance, power and energy*		
			M.ED.5	*Apply and relate Ohms Law*		
			M.ED.6	*Read and interpret color codes to identify resistors*		
			M.ED.7	*Measure properties of a circuit using VOM and DVM meters*		
			M.ED.8	*Compute and measure conductance and resistance of conductors and insulators*		
			M.ED.9	*Analyze, construct and troubleshoot series circuits, parallel circuits, series-parallel circuits and voltage dividers*		
			M.ED.10	*Solve network theorem problems using Kirchhoff, Thevenin, Norton, Superposition and Delta-Wye*		
			M.ED.11	*Analyze, construct and troubleshoot maximum power transfer theory*		
			M.ED.12	*Define magnetic properties of circuits and devices*		
			M.ED.13	*Determine physical and electrical characteristics of capacitors and inductors*		

			M.ED.14	*Analyze and measure RL and RC time constants*
			M.ED.15	*Set up and operate VOM, DVM, power supplies and oscilloscopes for DC circuits*
2	**1**	**N**	**CODE**	**MECHATRONICS ELECTRONICS AC CIRCUITS (M.EA)**
			M.EA.1	*Solve basic trigonometric problems as applicable to electronics (prerequisite to AC)*
			M.EA.2	*Identify properties of an AC signal*
			M.EA.3	*Identify AC sources*
			M.EA.4	*Analyze and measure AC signals using oscilloscope, frequency meters and generators*
			M.EA.5	*Analyze, construct and troubleshoot AC capacitive circuits, AC inductive circuits, RLC circuits (Series, Parallel, Complex) series and parallel resonant circuits, filter circuits and polyphase circuits*
			M.EA.6	*Analyze basic motor theory and operation*
			M.EA.7	*Analyze basic generator theory and operation*
			M.EA.8	*Set up and operate VOM, DVM and power supplies for AC circuits*
			M.EA.9	*Set up and operate oscilloscopes, frequency counters, signal generators, capacitor- inductor analyzers and impedance bridges for AC circuits*
			M.EA.10	*Analyze and apply principles of transformers to AC circuits*
2	**1**	**N**	**CODE**	**MECHATRONICS ELECTRONICS SOLID STATE DEVICES (M.ES)**
			M.ES.1	*Identify properties of semiconductor materials*
			M.ES.2	*Analyze and measure characteristics of P-N junction diodes*
			M.ES.3	*Analyze and measure characteristics of special diodes*
			M.ES.4	*Analyze, construct and troubleshoot diode circuits*
			M.ES.5	*Identify, define and measure characteristics of bipolar transistors, thyristors and integrated circuits*
			M.ES.6	*Set up and operate VOM, DVM, and power supplies for solid state devices*
			M.ES.7	*Set up and operate oscilloscopes, frequency counters, signal generators, capacitor- inductor analyzers and impedance bridges for solid state devices*
			M.ES.8	*Set up and operate curve tracers and transistor testers*
2	**1**	**N**	**CODE**	**MECHATRONICS ELECTRONICS ANALOG CIRCUITS (M.EC)**
			M.EC.1	*Identify properties of semiconductor materials*
			M.EC.2	*Analyze and measure characteristics of P-N junction diodes*
			M.EC.3	*Analyze and measure characteristics of special diodes*
			M.EC.4	*Analyze, construct and troubleshoot diode circuits*
			M.EC.5	*Identify, define and measure characteristics of bipolar transistors, thyristors and integrated circuits*
			M.EC.6	*Set up and operate VOM, DVM, and power supplies for solid state devices*
2	**1**	**N**	**CODE**	**MECHATRONICS ELECTRONICS DIGITAL DEVICES (M.EDD)**

			M.EDD.1	*Define and apply number systems to codes and arithmetic*
			M.EDD.2	*Analyze, construct and troubleshoot logic gates, logic arithmetic circuits, flip-flops, and encoders and decoders*
			M.EDD.3	*Identify, define and measure characteristics of IC logic families*
			M.EDD.4	*Analyze, construct and troubleshoot registers and counters, clock and timing circuits, multiplexers and demultiplexers, and digital to analog and analog to digital*
			M.EDD.5	*Analyze, construct and troubleshoot displays and representative digital systems*
			M.EDD.6	*Set up and operate VOM, DVM and logic probes for digital devices*
			M.EDD.7	*Set up and operate power supplies, pulsers, oscilloscopes, logic analyzers, signature analyzers, pulse generators and counters for digital devices*
2	**1**	**N**	**CODE**	**MECHATRONICS ELECTRONICS MICROPROCESSING (M.EM)**
			M.EM.1	*Analyze, construct and troubleshoot CPUs, BUS systems, memory systems, and input/ output ports, microprocessor applications and systems*
			M.EM.2	*Execute computer instruction sets*
			M.EM.3	*Analyze and troubleshoot microcomputer systems*
			M.EM.4	*Set up and operate VOM, DVM, logic probes, power supplies, pulsers, oscilloscopes, logic/data analyzers, signature analyzers, pulse generators and counters for microprocessing*
2	**1**	**N**	**CODE**	**MECHATRONICS ELECTRONICS LAB PRACTICES (M.EL.)**
			M.EL.1	*Demonstrate proper safety standards*
			M.EL.2	*Make electrical connections*
			M.EL.3	*Identify and use hand and power tools properly*
2	**1**	**N**	**CODE**	**MECHATRONICS MOTOR CONTROL SAFETY (M.MS)**
			M.MS.1	*Application of shop rules and regulations*
			M.MS.2	*Correct use of electrical and hand tools*
			M.MS.3	*Techniques and practices of working on live equipment*
			M.MS.4	*Demonstrate proper grounding methods*
2	**1**	**N**	**CODE**	**MECHATRONICS MOTOR CONTROL TOOLS (M.MT)**
			M.MT.1	*Use of and dexterity with hand tools*
			M.MT.2	*Use and connection of electrical test equipment*
			M.MT.3	*Operation of special equipment (benders, KO punches, etc.)*
			M.MT.4	*Operation of electrical power tools*
			M.MT.5	*Operation of conduit cutting and reaming equipment*
2	**1**	**N**	**CODE**	**MECHATRONICS MOTOR CONTROL CALCULATIONS (M.MC.)**

			M.MC.1	*Size branch circuit conductors*
			M.MC.2	*Size feeder conductors*
			M.MC.3	*Size control conductors*
			M.MC.4	*Size overcurrent protection for branch circuit*
			M.MC.5	*Size overcurrent protection for feeder circuit*
			M.MC.6	*Size overloads protection*
			M.MC.7	*Calculate conduit fill*
2	1	N	CODE	**MECHATRONICS MOTOR CONTROL TRADE INFORMATION (M.MTI)**
			M.MTI.1	*Use and application of the National Electrical Code*
			M.MTI.2	*Demonstrate the ability to draw wiring Diagrams and ladder diagrams*
			M.MTI.3	*Demonstrate the ability to interpret wiring diagrams*
2	1	N	CODE	**MECHATRONICS MOTOR CONTROL RACEWAYS (M.MR)**
			M.MR.1	*Demonstrate the ability to mount enclosures according to specifications*
			M.MR.2	*Demonstrate the ability to bend and install raceways using the proper tools and supplies*
2	1	N	CODE	**MECHATRONICS MOTOR CONTROL INSTALLATION (M.MI)**
			M.MI.1	*Install and connect a Disconnect switch*
			M.MI.2	*Install and connect Push buttons*
			M.MI.3	*Install and connect Selector switches*
			M.MI.4	*Install and connect Indicator lights*
			M.MI.5	*Install and connect Limit switches*
			M.MI.6	*Install and connect Control transformers*
			M.MI.7	*Install and connect Control relays*
			M.MI.8	*Install and connect Timing relays (all types)*
			M.MI.9	*Install and connect Contractors*
			M.MI.10	*Install and connect Motor starters*
			M.MI.11	*Install and connect Photoelectric switches*
			M.MI.12	*Install and connect a Temperature control*
			M.MI.13	*Install and connect Counters*
			M.MI.14	*Install and connect Overload relays*
			M.MI.15	*Install and connect Solid-state motor starters*
			M.MI.16	*Properly wire a dual-voltage motor*
			M.MI.17	*Install and connect Reversing motor starters*

			M.MI.18	*Install and connect Press-to-test pilot lights*
2	**1**	**N**	**CODE**	**MECHATRONICS SKILLS (M.S)**
			M.S.1	*Install Programmable Logic controllers and systems*
			M.S.2	*Adjust Programmable Logic controllers and systems*
			M.S.3	*Troubleshoot Programmable Logic controllers and systems*
			M.S.4	*Select threaded fasteners*
			M.S.5	*Install threaded fasteners*
			M.S.6	*Perform precision measuring on mechanical components*
			M.S.7	*Install pneumatic and hydraulic systems*
			M.S.8	*Service pneumatic and hydraulic systems*
			M.S.9	*Adjust pneumatic and hydraulic systems*
			M.S.10	*Troubleshoot pneumatic and hydraulic systems*
			M.S.11	*Install electro-pneumatic and electro-hydraulic systems*
			M.S.12	*Adjust electro-pneumatic and electro-hydraulic systems*
			M.S.13	*Troubleshoot electro-pneumatic and electro-hydraulic systems*
			M.S.14	*Read construction blueprints*
			M.S.15	*Read electrical blueprints*
			M.S.16	*Read mechanical blueprints*