

K TO 12 BASIC EDUCATION CURRICULUM
JUNIOR HIGH SCHOOL TECHNOLOGY AND LIVELIHOOD TRACK AND SENIOR HIGH SCHOOL – TECHNICAL-VOCATIONAL LIVELIHOOD TRACK
INDUSTRIAL ARTS – AUTOMOTIVE SERVICING NC II
(320 hours)

These are the specializations and their pre-requisites. These lists should be used as reference for curriculum maps.

AGRI-FISHERY ARTS

	Specialization	Number of Hours	Pre-requisite
1.	Agricultural Crops Production (NC I)		
2.	Agricultural Crops Production (NC II) ⁺⁺	480 hours	
3.	Agricultural Crops Production (NC III)	640 hours	Agricultural Crops Production (NC II)
4.	Animal Health Care Management (NC III)	320 hours	Animal Production (NC II)
5.	Animal Production (NC II) ⁺ <i>When updated, this CG will become the following:</i> 1. Animal Production (Poultry-Chicken) (NC II); 2. Animal Production (Ruminants) (NC II); and 3. Animal Production (Swine) (NC II)	480 hours	
6.	Aquaculture (NC II)	640 hours	
7.	Artificial Insemination (Ruminants) (NC II)	160 hours	Animal Production (NC II)
8.	Artificial Insemination (Swine) (NC II)	160 hours	Animal Production (NC II)
9.	Agricultural Crops Production (NC I)	320 hours	
10.	Fish Capture (NC II) ⁺⁺	640 hours	
11.	Fishing Gear Repair and Maintenance (NC III)	320 hours	
12.	Fish-Products Packaging (NC II)	320 hours	
13.	Fish Wharf Operation (NC I)	160 hours	
14.	Food (Fish) Processing (NC II)	640 hours	
15.	Horticulture (NC II) ⁺	640 hours	
16.	Horticulture (NC III)	640 hours	Horticulture (NC II)
17.	Landscape Installation and Maintenance (NC II)	320 hours	Agricultural Crops Production (NC I)
18.	Organic Agriculture (NC II)	320 hours	Agricultural Crops Production (NC I)
19.	Pest Management (NC II)	320 hours	Agricultural Crops Production (NC I)
20.	Rice Machinery Operation (NC II)	320 hours	Agricultural Crops Production (NC I)
21.	Rubber Processing (NC II)	320 hours	
22.	Rubber Production (NC II)	320 hours	
23.	Slaughtering Operation (NC II)	160 hours	Animal Production (NC II)

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HOME ECONOMICS

	Specialization	Number of Hours	Pre-requisite
1.	Attractions and Theme Parks (NC II)	160 hours	
2.	Barbering (NC II)	320 hours	
3.	Bartending (NC II)	320 hours	
4.	Beauty/Nail Care (NC II)	160 hours	40 hours of the subject during exploratory Grade 7/8
5.	Bread and Pastry Production (NC II)	160 hours	
6.	Caregiving (NC II)	640 hours	40 hours of the subject during exploratory Grade 7/8
7.	Commercial Cooking (NC III)	320 hours	Cookery (NC II)
8.	Cookery (NC II)	320 hours	40 hours of the subject during exploratory Grade 7/8
9.	Dressmaking (NC II)	320 hours	40 hours of the subject during exploratory Grade 7/8
10.	Events Management Services (NC III)	320 hours	
11.	Fashion Design (Apparel) (NC III)	640 hours	Dressmaking (NC II) or Tailoring (NC II)
12.	Food and Beverage Services (NC II) ⁺	160 hours	
13.	Front Office Services (NC II)	160 hours	40 hours of the subject during exploratory Grade 7/8
14.	Hairdressing (NC II)	320 hours	
15.	Hairdressing (NC III)	640 hours	Hairdressing (NC II)
16.	Handicraft (Basketry, Macrame) (Non-NC)	160 hours	
17.	Handicraft (Fashion Accessories, Paper Craft) (Non-NC)	160 hours	
18.	Handicraft (Needlecraft) (Non-NC)	160 hours	
19.	Handicraft (Woodcraft, Leathercraft) (Non-NC)	160 hours	
20.	Housekeeping (NC II) ⁺	160 hours	
21.	Local Guiding Services (NC II)	160 hours	
22.	Tailoring (NC II)	320 hours	40 hours of the subject during exploratory Grade 7/8
23.	Tourism Promotion Services (NC II)	160 hours	
24.	Travel Services (NC II)	160 hours	
25.	Wellness Massage (NC II)	160 hours	

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INDUSTRIAL ARTS

	Specialization	Number of Hours	Pre-requisite
1.	Automotive Servicing (NC I) ⁺	640 hours	
2.	Automotive Servicing (NC II)	640 hours	Automotive Servicing (NC I)
3.	Carpentry (NC II)	640 hours	
4.	Carpentry (NC III)	320 hours	Carpentry (NC II)
5.	Construction Painting (NC II)	160 hours	
6.	Consumer Electronics Servicing (NC II) ⁺	640 hours	
7.	Domestic Refrigeration and Airconditioning (DOMRAC) Servicing (NC II)	640 hours	
8.	Driving (NC II)	160 hours	
9.	Electrical Installation and Maintenance (NC II)	640 hours	
10.	Electric Power Distribution Line Construction (NC II)	320 hours	Electrical Installation and Maintenance (NC II)
11.	Electronic Products Assembly and Servicing (NC II) ⁺⁺ <i>(CG under construction based on Consumer Electronics Servicing (NC II) CG)</i>	640 hours	
12.	Furniture Making (Finishing) (NC II) ⁺	480 hours	
13.	Instrumentation and Control Servicing (NC II)	320 hours	Electronic Products Assembly and Servicing (EPAS) (NC II)
14.	Gas Metal Arc Welding (GMAW) (NC II)	320 hours	Shielded Metal Arc Welding (SMAW) (NC II)
15.	Gas Tungsten Arc Welding (GTAW) (NC II)	320 hours	Shielded Metal Arc Welding (GMAW) (NC II)
16.	Machining (NC I) ⁺⁺	640 hours	
17.	Machining (NC II)	640 hours	Machining (NC I)
18.	Masonry (NC II)	320 hours	
19.	Mechatronics Servicing (NC II)	320 hours	Consumer Electronics Servicing (NC II)
20.	Motorcycle/Small Engine Servicing (NC II)	320 hours	
21.	Plumbing (NC I)	320 hours	
22.	Plumbing (NC II)	320 hours	Plumbing (NC I)
23.	Refrigeration and Air-Conditioning (Packaged Air-Conditioning Unit [PACU]/Commercial Refrigeration Equipment [CRE]) Servicing (NC III)	640 hours	Domestic Refrigeration and Airconditioning (DOMRAC) Servicing (NC II)
24.	Shielded Metal Arc Welding (NC I)	320 hours	
25.	Shielded Metal Arc Welding (NC II)	320 hours	Shielded Metal Arc Welding (NC I)
26.	Tile Setting (NC II)	320 hours	
27.	Transmission Line Installation and Maintenance (NC II)	640 hours	Electrical Installation and Maintenance (NC II)

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INFORMATION, COMMUNICATIONS AND TECHNOLOGY (ICT)

	Specialization	Number of Hours	Pre-requisite
1.	Animation (NC II)	320 hours	
2.	Broadband Installation (Fixed Wireless Systems) (NC II)	160 hours	1. Telecom OSP and Subscriber Line Installation (Copper Cable/POTS and DSL) (NC II) 2. Telecom OSP Installation (Fiber Optic Cable) (NC II)
3.	Computer Hardware Servicing (NC II) ⁺	320 hours	
4.	Computer Programming (NC IV) ⁺ <i>When updated, this CG will become the following:</i> 1. Programming (.net Technology) (NC II) ⁺⁺ 2. Programming (Java) (NC II) ⁺⁺ 3. Programming (Oracle Database) (NC II) ⁺⁺	320 hours	
5.	Computer System Servicing (NC II) ⁺⁺ <i>(CG under construction based on Computer Hardware Servicing (NC II) CG)</i>	320 hours	
6.	Contact Center Services (NC II)	320 hours	
7.	Illustration (NC II)	320 hours	
8.	Medical Transcription (NC II)	320 hours	
9.	Technical Drafting (NC II)	320 hours	
10.	Telecom OSP and Subscriber Line Installation (Copper Cable/POTS and DSL) (NC II)	320 hours	Computer Hardware Servicing (NC II)
11.	Telecom OSP Installation (Fiber Optic Cable) (NC II)	160 hours	Telecom OSP and Subscriber Line Installation (Copper Cable/POTS and DSL) (NC II)

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Prerequisite: Automotive Servicing NC I

Course Description:

This course is designed to enhance the knowledge, skills and attitudes of an individual in the field of Automotive Servicing in accordance with industry standards. It covers the remaining core competencies which are not included in Automotive Servicing (NC I) such as: servicing automotive battery, servicing ignition system, testing and repairing wiring/lighting system, servicing starting system, servicing charging system, servicing engine mechanical system, servicing clutch system, servicing clutch and differential and front axle, servicing steering system, servicing brake system, servicing suspension system, performing underchassis preventive maintenance and overhauling manual transmission.

CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<p>Introduction</p> <ol style="list-style-type: none"> 1. Advance concepts in Automotive Servicing 2. Relevance of the course 3. Career opportunities 	<p>The learner demonstrates an understanding of the advance concepts and underlying theories in Automotive Servicing.</p>	<p>The learner independently demonstrates core competencies in Automotive Servicing as prescribed by TESDA Training Regulations.</p>	<ol style="list-style-type: none"> 1. Explain basic concepts in Automotive Servicing. 2. Discuss the relevance of the course. 3. Explore career opportunities in Automotive Servicing. 	
PERSONAL ENTREPRENEURIAL COMPETENCIES AND SKILLS (PECS)				
<ol style="list-style-type: none"> 1. Assessment of learner’s Personal Competencies and Skills (PECS) vis-à-vis those of a practicing entrepreneur/employee in a province. <ol style="list-style-type: none"> 1.1 Characteristics 1.2 Attributes 1.3 Lifestyle 1.4 Skills 1.5 Traits 2. Analysis of learner’s PECS compared to a practitioner’s PECS 3. Strengthening and developing further one’s PECS 	<p>The learner demonstrates an understanding of one’s Personal Competencies and Skills (PECS) in Automotive Servicing.</p>	<p>The learner independently creates a plan of action that strengthens/develops one’s PECS in Automotive Servicing.</p>	<p>LO 1. Develop and strengthen personal competencies and skills (PECS) needed in Automotive Servicing.</p> <ol style="list-style-type: none"> 1.1 Identify areas for improvement, development and growth. 1.2 Align one’s PECS according to his/her business/career choice. 1.3 Create a plan of action that ensures success of his/her business/career choice. 	TLE_PECS9-12-00-1

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
ENVIRONMENT AND MARKET (EM)				
<ol style="list-style-type: none"> 1. Product Development 2. Key concepts in developing a product 3. Finding Value 4. Innovation <ol style="list-style-type: none"> 4.1 Unique Selling Proposition(USP) 	<p>The learner demonstrates an understanding of the concepts of environment and market and how they relate to the field of Automotive Servicing, particularly in one’s town/municipality.</p>	<p>The learner independently creates a business vicinity map reflective of the potential Automotive Servicing market within the locality/town.</p>	<p>LO 1. Develop a product service in Automotive Servicing.</p> <ol style="list-style-type: none"> 1.1 Identify what is of “Value” to the Customer. 1.2 Identify the customer. 1.3 Explain what makes a product unique and competitive. 1.4 Apply creativity and innovative techniques to develop marketable product. 1.5 Employ a Unique Selling Proposition (USP) to the product/service. 	<p>TLE_EM9-12-00-1</p>
<ol style="list-style-type: none"> 1. Selecting Business Idea 2. Key concepts in selecting a business idea <ol style="list-style-type: none"> 2.1 Criteria 2.2 Techniques 			<p>LO 2. Select a business idea based on the criteria and techniques set.</p> <ol style="list-style-type: none"> 2.1 Enumerate various criteria and steps in selecting a business idea. 2.2 Apply the criteria/steps in selecting a viable business idea. 2.3 Determine a business idea based on the criteria/techniques set. 	
<ol style="list-style-type: none"> 1. Branding 			<p>LO 3. Develop a brand for the product.</p> <ol style="list-style-type: none"> 3.1 Identify the benefits of having a good brand. 3.2 Enumerate recognizable brands in the town/province. 3.3 Enumerate the criteria for developing a brand. 3.4 Generate a clear appealing brand. 	

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
CORE COMPETENCIES				
LESSON 1: SERVICING AUTOMOTIVE BATTERY (SAB)				
<ul style="list-style-type: none"> • Components of batteries • Types of batteries • Classification of batteries • Charging and discharging processes • Hazards associated with use of batteries • Safe handling of batteries 	The learner demonstrates an understanding of the principles in servicing the automotive battery.	The learner independently services an automotive battery.	LO 1. Explain the operation and safe handling of different types of batteries. 1.1 Identify main components of batteries. 1.2 Classify types of batteries. 1.3 Observe proper safe handling of batteries. 1.4 Identify hazards associated with batteries. 1.5 Identify proper and safe disposal of discarded battery materials like solutions and components.	TLE_IAAUS9-12SAB-Ia-b-1
<ul style="list-style-type: none"> • Different types of battery testing <ul style="list-style-type: none"> - Procedures in testing - Hydrometer - Cell tester • Load tester/multi-tester • Testing tools and equipment • Personal safety in testing battery • Oral and written communication • Science and math: solution, electrolyte, ratio and proportion, temperature 			LO 2. Demonstrate the testing of an automotive battery. 2.1 Select appropriate test equipment. 2.2 Test different types of batteries. 2.3 Analyze test results. 2.4 Compare battery test result based on manufacturer’s specification. 2.5 Observe safety at all times while doing battery test. 2.6 Report findings of test results.	TLE_IAAUS9-12SAB-Ic-d-2
<ul style="list-style-type: none"> • Safety procedures in removing/replacing battery • Correct tools and equipment in removing/replacing battery • Hazards in removing/replacing battery • Procedure in removing/replacing battery <ul style="list-style-type: none"> - Conventional - Electronic control 			LO 3. Demonstrate the procedure in removing and replacing batteries. 3.1 Remove battery without causing damage to workplace, property or vehicle. 3.2 Follow the proper procedure in replacing battery. 3.3 Follow the proper procedure to prevent loss of vehicle’s electronic memory as per manufacturer’s standard. 3.4 Select appropriate tools and equipment. 3.5 Observe personal safety in removing and replacing batteries. 3.6 Use appropriate PPE.	TLE_IAAUS9-12SAB-Ie-f-3

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Parts and functions of battery charger • Repairing/cleaning and replacing connectors • Topping, filling electrolyte/distilled water • Procedures in battery charging <ul style="list-style-type: none"> - Fast - Slow • Manual/automatic battery cleaning • Proper connection of battery terminals • PPE/safety practices 			<p>LO 4. Demonstrate the procedures in servicing the battery.</p> <p>4.1 Charge the battery using the appropriate battery charger.</p> <p>4.2 Check electrolyte levels and fill up if necessary.</p> <p>4.3 Clean battery terminals and its connectors.</p> <p>4.4 Connect and disconnect battery clamps in sequence as indicated in the manual.</p> <p>4.5 Observe personal safety in servicing the battery.</p>	<p>TLE_IAAUS9-12SAB-Ig-h-4</p>
<ul style="list-style-type: none"> • Jump starting procedures • PPE/safety precautions • Polarity connection • Jump starting Connection 			<p>LO 5. Demonstrate the procedures in jump starting.</p> <p>5.1 Jump starts the battery without causing damage to workplace and property.</p> <p>5.2 Select appropriate jumper leads.</p> <p>5.3 Connect and disconnect battery clamps in sequence as indicated in the manual.</p> <p>5.4 Observe personal safety in jump starting.</p>	<p>TLE_IAAUS9-12SAB-Ii-j-5</p>
LESSON 2: SERVICING IGNITION SYSTEM (SIS)				
<ul style="list-style-type: none"> • Parts and function of ignition system components • Ignition system troubles and remedies 	<p>The learner demonstrates an understanding of the principles in servicing the ignition system.</p>	<p>The learner independently services the ignition system.</p>	<p>LO 1. Explain the function of ignition system components.</p> <p>1.1 Identify the types of ignition systems.</p> <p>1.2 Explain the component parts of the ignition system.</p> <p>1.3 Interpret ignition system diagram.</p> <p>1.4 Explain the possible remedies for the identified ignition system troubles.</p>	<p>TLE_IAAUS9-12SIS-IIa-b-6</p>

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> Procedures in disconnecting different wire terminals. Distributor setting procedures Spark test procedures Spark analysis Ignition system wiring diagram 			LO 2. Check ignition coil, ballast resistor and high-tension cable resistance. 2.1 Inspect and test ignition coil. 2.2 Inspect and test ballast resistor. 2.3 Check high tension cable resistance. 2.4 Test wiring installation. 2.5 Test and analyze ignition system electrical spark.	TLE_IAAUS9-12SIS-IIc-g-7
<ul style="list-style-type: none"> Use of tools and equipment in ignition timing Procedure in ignition timing Safety precautions in ignition timing Use of measuring instrument Dwell angle measurement RPM measurement 			LO 3. Check distributor assembly. 3.1 Check dwell angle and RPM. 3.2 Check and adjust ignition timing as per service manual. 3.3 Evaluate ignition timing performance.	TLE_IAAUS9-12SIS-IIh-j-8
LESSON 3: TESTING AND REPAIRING WIRING/LIGHTING SYSTEM (TRW)				
<ul style="list-style-type: none"> Ohm’s law Schematic diagram and circuitry Signs and symbols Sizes/color code/ampere Rating of wires Polarity, conductor and non-conductors Laws of magnetism and electric charges 	The learner demonstrates an understanding of the principles in servicing of the wiring/lighting system.	The learner independently performs servicing of the wiring /lighting system.	LO 1. Explain the principle of auto electricity. 1.1 Explain Ohm’s law. 1.2 Explain the Law of magnetism. 1.3 Draw schematic diagram of an electrical circuit. 1.4 Interpret signs and symbols. 1.5 Identify size of wire according to job requirement. 1.6 Determine polarity, conductor and insulator.	TLE_IAAUS9-12TRW-IIIa-b-9
<ul style="list-style-type: none"> Component parts of the lighting system Functions of: <ul style="list-style-type: none"> Headlights Park and tail lights 			LO 2. Explain Automotive Lighting System and its functions. 2.1 Identify components of the lighting system. 2.2 Explain functions of lighting system parts.	TLE_IAAUS9-12TRW-IIIc-d-10

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<ul style="list-style-type: none"> - Signal/hazard lights - Back-up lights - Interior lights - Horns • Occupational health and safety practices 			2.3 Observe occupational health and safety practices.	
<ul style="list-style-type: none"> • Procedures in installing lighting system • Principles of auto electricity and their applications • Personal safety requirements • Reading and Interpreting circuits and diagrams • Soldering and crimping • Installing/repairing components and wiring 			LO 3. Install wiring/lighting system. 3.1 Interpret lighting system circuit diagram. 3.2 Install electrical devices such as switches, lights and fuse boxes. 3.3 Install wires leading to different lights and other relevant devices. 3.4 Solder and crimp lead terminals of wires.	TLE_ IAAUS9-12TRW-IIIe-g-11
<ul style="list-style-type: none"> • Hand tools, testing equipment including multi-meters and test lamp • Reading and interpretation of circuit and diagrams • Testing and electrical measurements • Fault finding using aural, visual and functional assessments for damage, correction, wear and electrical defects • Installing/repairing components and wiring • Soldering • Crimping 			LO 4. Test electrical system and determine preferred action. 4.1 Test electrical system without causing damage to workplace or vehicle. 4.2 Perform correct procedure for testing and interpreting schematic diagram in accordance with the manufacturer’s specification. 4.3 Determine faults/defects using appropriate tools and techniques. 4.4 Execute remedies based on the identified faults/defects.	TLE-IAAUS9-12TRW-IIIh-i-12

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Procedures in repairing electrical system • Reading and interpretation of circuit and diagram • Hand tools, testing equipment, multi testers • Open, close and short circuits • Occupational, health and safety practices related to job 			<p>LO 5. Carry out necessary repair in the electrical system.</p> <p>5.1 Identify procedure in repairing electrical system.</p> <p>5.2 Interpret information based on assessment.</p> <p>5.3 Use appropriate tools, technique and materials in repairing electrical system.</p> <p>5.4 Repair electrical system without causing damage to workplace, property or vehicle.</p>	<p>TLE_IAAUS9-12TRW-IIIi-j-13</p>
LESSON 4: SERVICING STARTING SYSTEM (SSS)				
<ul style="list-style-type: none"> • Starting system principles, operation, components and their function • Starting system types and their characteristics • Electrical connections and current flow • Basic hand tools, testing equipment including, multi-meters, volt meters, ammeters, test light, • Power tools, air tools, electrical loading equipment, test benches soldering equipment multi-meters, growler, induction ammeter, test light (12V and 24V), lathe, single and gauged panel CRO • Testing, dismantling, assembling, removal and replacement of components • Fault finding using aural, visual and functional (assessment) test for damage corrosion, wear and 	<p>The learner demonstrates an understanding of concepts and underlying principles of servicing the starting system.</p>	<p>The learner independently performs servicing the starting system based on industry standard.</p>	<p>LO 1. Test starting system components and identify faults.</p> <p>1.1 Identify the components of the starting system.</p> <p>1.2 Identify starting system faults and its remedies.</p> <p>1.3 Test starting system in accordance with the industry standard procedures.</p> <p>1.4 Connect starting system circuitry based on the industry standards.</p>	<p>TLE_IAAUS9-12TRW-IVa-d-14</p>

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> electrical short/broken circuits electrical measurements • Reading and interpreting of wiring diagrams • Jump start the vehicle • Electrical principles • Repair procedure and techniques application • Electrical measuring and testing procedures • Vehicle safety requirements 				
<ul style="list-style-type: none"> • Parts of starter motor • Starter motor operation • Types of starter motor and their application • Tools & equipment needed in disassembling starter motor • Procedure in disassembling starter motor • Procedure in testing starter motor parts • Explain defective parts 			<p>LO 2. Disassemble starter.</p> <ul style="list-style-type: none"> 2.1 Identify starter motor parts. 2.2 Explain starter motor function and operation. 2.3 Disassemble starter motor according to service manual. 2.4 Test/Check starter motor parts. 2.5 Identify defective parts of a starter motor. 	<p>TLE_IAAUS9-12TRW-IVd-h-15</p>
<ul style="list-style-type: none"> • Tools and materials needed in servicing starting system • Service manual in starter motor repair • Procedure in checking, repairing starter motor • Test starter motor functionality • Safety procedures in assembling starter motor 			<p>LO3. Repair/replace and assemble starter components/parts.</p> <ul style="list-style-type: none"> 3.1 Repair or replace defective parts of starter motor in accordance with the manufacturer’s manual. 3.2 Assemble starter motor in accordance with manufacturer’s standard. 3.3 Perform bench testing. 	<p>TLE_IAAUS9-12TRW-IVh-j-16</p>

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
LESSON 5: SERVICING CHARGING SYSTEM (SCH)				
<ul style="list-style-type: none"> • Charging system purpose and principle operation • Parts and functions of alternator • Types of alternator • Procedure in disconnecting different wire terminals • Observing safety measures • Testing charging system component parts • Identifying faults and faulty parts • Voltage regulator purpose and operation • Types of voltage regulator • Safety precautions on charging system servicing 	The learner demonstrates an understanding of concepts and underlying principles in servicing the charging system.	The learner independently performs servicing the charging system based on industry standard.	LO 1. Test charging system component and identify faults. 1.1 Identify charging system components. 1.2 Identify charging system faults. 1.3 Determine possible remedies for the charging system faults. 1.4 Carry out testing procedures based on standard industry procedures. 1.5 Identify defective voltage regulator. 1.6 Perform load and no load test in a vehicle.	TLE_IAAUS9-12SCH-Ia-c-17
<ul style="list-style-type: none"> • Procedures in disassembling alternator • Observing safety measures • Identifying defective alternator parts 			LO 2. Disassemble alternator. 2.1 Explain the function and parts of an alternator. 2.2 Disassemble alternator based on the procedures stated in the service manual. 2.3 Test alternator parts to determine faults. 2.4 Identify defective parts of alternator.	TLE_IAAUS9-12SCH-Ic-e-18
<ul style="list-style-type: none"> • Procedures in repairing/replacing and assembling alternator components/parts. • Observing safety measures • Testing assembled alternator 			LO 3. Repair/replace and assemble alternator components/parts. 3.1 Repair defective parts in accordance to service manual. 3.2 Replace defective parts in accordance to service manual. 3.3 Assemble alternator following the manufacturer’s specifications. 3.4 Perform alternator bench testing to check functionality.	TLE_IAAUS9-12SCH-If-h-19

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
LESSON 6: SERVICING MECHANICAL SYSTEM - COOLING SYSTEM (SMS)				
<ul style="list-style-type: none"> • Purpose of cooling system • Types of cooling system • Parts and functions of cooling system • Coolant flow/circulation in cooling system • Effects of coolant additives to cooling system. 	The learners demonstrate an understanding of concepts and underlying principles in servicing the cooling system.	The learner independently performs servicing the cooling system based on industry standard.	<p>LO 1. Explain coolant circulation within cooling system.</p> <p>1.1 Explain the purpose of cooling system.</p> <p>1.2 Determine the type of cooling system in the vehicle.</p> <p>1.3 Identify parts of the cooling system.</p> <p>1.4 Explain the function of the parts of the cooling system.</p> <p>1.5 Explain coolant circulation.</p>	TLE_IAAUS9-12SCS-Ih-i-20
<ul style="list-style-type: none"> • Operation and function of cooling system thermostat • Types of thermostat • Procedure in checking thermostat • Effects of defective thermostat to engine • Preparing inspection record and reports • Tools and equipment used for checking thermostat 			<p>LO 2. Check thermostat condition.</p> <p>2.1 Check/determine thermostat condition in accordance with the manufacturer’s specifications.</p> <p>2.2 Determine the location of the thermostat.</p> <p>2.3 Check thermostat condition in accordance with industry procedures (delete above).</p> <p>2.4 Record and report inspection result.</p> <p>2.5 Remove and replace thermostat.</p>	TLE_IAAUS9-12SCS-Ii-21
<ul style="list-style-type: none"> • Leakage test tools and equipment and proper handling. • Leakage test procedures and techniques. • Preparing and handling/reporting of test results. • Using of service manuals. 			<p>LO3. Perform leakage test on cooling system.</p> <p>3.1 Obtain technical data pertaining to engine cooling system in conformity with service manual.</p> <p>3.2 Perform leak test in accordance with industry procedures.</p> <p>3.3 Record test results and determine preferred actions.</p> <p>3.4 Pre-heat coolant in accordance with the specifications in the service manual.</p>	TLE_IAAUS9-12SCS-Ij-22

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Types of engine water pumps • Water pump specifications • Procedures in checking engine water pump • Procedures in dismantling/replacing water pump/parts • How to use service manuals • Safety precautions 			<p>LO 4. Repair/replace water pump.</p> <p>4.1 Obtain technical data of engine water pump using the service manual.</p> <p>4.2 Inspect water pump and faults are determined.</p> <p>4.3 Determine replacement parts of water pump.</p> <p>4.4 Dismantle water pump in accordance with the service manual.</p> <p>4.5 Replace water pump and its parts in accordance with manufacturer’s specifications.</p> <p>4.6 Install water pump and its parts in accordance with manufacturer’s specifications.</p>	<p>TLE_IAAUS9-12SCS-Ij-IIa-23</p>
<ul style="list-style-type: none"> • Types of coolant additives • Coolant additives applications • Advantage of using coolant additives 			<p>LO 5. Apply Coolant Additives.</p> <p>5.1 Obtain technical specifications of coolant additives.</p> <p>5.2 Select coolant additives in accordance with manufacturer’s specifications.</p> <p>5.3 Apply coolant additives in accordance with manufacturer’s specifications.</p>	<p>TLE_IAAUS9-12SCS-IIb-24</p>
LESSON 7: SERVICING MECHANICAL SYSTEM - LUBRICATING SYSTEM (SLS)				
<ul style="list-style-type: none"> • Purpose of lubricating system • Components of lubricating system • Function of the following: <ul style="list-style-type: none"> - Oil pump - Oil filter - Oil strainer/pump - Oil pan - Oil cooler - Oil pressure relief valve • Pressure gauge/indicator • Oil cycle in the system • Oil pressure and quantity 	<p>The learner demonstrates an understanding of concepts and underlying principles in servicing the lubricating system.</p>	<p>The learner independently performs servicing the lubricating system based on industry standard.</p>	<p>LO1. Explain the oil cycle within the engine.</p> <p>1.1 Identify component parts of the lubricating system.</p> <p>1.2 Explain the function of each part of the lubricating system.</p> <p>1.3 Discuss the lubricating system cycle.</p>	<p>TLE_IAAUS9-12SLS-IIb-c-25</p>

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Types and classifications of engine oil • Oil viscosity number • Application of engine oil • Functions of oil in the engine parts • Engine oil for diesel engine • Engine oil for gasoline engine 			<p>LO2. Identify types, classifications and applications of engine oil.</p> <p>2.1 Identify the different types and classifications of engine oil.</p> <p>2.2 Explain the correct application and uses of engine oil.</p>	<p>TLE_IAAUS9-12SLS-IIc-d-26</p>
<ul style="list-style-type: none"> • Tools needed in overhauling pump, replacing oil filter and changing oil. • Procedure in: <ul style="list-style-type: none"> - Overhauling oil pump - Replacing oil filter - Changing oil • Occupational Health and safety in repairing lubricating system 			<p>LO3.Overhaul oil pump, replace oil filter and change oil.</p> <p>3.1 Follow proper procedures in overhauling oil pump, replacing oil filter and changing oil.</p> <p>3.2 Observe personal safety while performing the tasks.</p>	<p>TLE_IAAUS9-12SLS-IIId-e-27</p>
LESSON 8: SERVICING MECHANICAL SYSTEM - GASOLINE FUEL SYSTEM (SGF)				
<ul style="list-style-type: none"> • Correct fuel octane rating • Data gathering methods • Safety measure in handling fuels 	<p>The learner demonstrates an understanding of concepts and underlying principles in servicing the gasoline fuel system.</p>	<p>The learner independently performs servicing the gasoline fuel system based on industry standard.</p>	<p>LO1.Explain fuel octane rating.</p> <p>1.1 Use the correct fuel octane rating in accordance with the manufacturer’s specifications.</p> <p>1.2 Interpret data from American Petroleum Institute (API).</p> <p>1.3 Apply safety measures in dealing with fuel.</p>	<p>TLE_IAAUS9-12SGF-IIe-f-28</p>
<ul style="list-style-type: none"> • Types of fuel pumps • Classification of fuel pump • Servicing fuel pump 			<p>LO2. Identify fuel pump types and classification.</p> <p>2.1 Identify fuel pumps according to usage.</p> <p>2.2 Obtain fuel pump classifications according to manufacturer’s specifications.</p> <p>2.3 Service fuel pump according to manufacturer’s specifications.</p>	<p>TLE_IAAUS9-12SGF-IIIf-g-29</p>

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Correct use of tools • Adjustment is referred to repair manual • Tools and equipment in adjusting carburetor • Correct usage of tools and equipment • Performing adjustment using industry procedure 			LO3. Perform carburetor adjustment. 3.1 Obtain carburetor adjustment in accordance with the repair manual. 3.2 Perform carburetor adjustments according to industry operating procedures.	TLE_IAAUS9-12SGF-IIg-i-30
<ul style="list-style-type: none"> • Methods of gathering and interpreting data • Tools and equipment in overhauling carburetor • Steps in overhauling carburetor 			LO 4. Overhaul carburetor. 4.1 Interpret data from manufacturer’s specifications. 4.2 Use tools and equipment in accordance with the industry standard. 4.3 Overhaul carburetor in accordance with the required procedures.	TLE_IAAUS9-12SGF-IIIj-j-31
LESSON 9: SERVICING MECHANICAL SYSTEM - AIR INDUCTION SYSTEM (SAI)				
<ul style="list-style-type: none"> • Turbocharger characteristics and operation • Tools and equipment in checking turbocharger • Turbocharger pressure referred to manufacturer’s specification • Axial and radial play of turbine shaft 	The learners demonstrate an understanding of concepts and underlying principles in servicing the air induction system.	The learner independently performs servicing the air induction system based on industry standard.	LO 1. Check turbocharger operation. 1.1 Explain turbocharger operation. 1.2 Observe correct procedures in checking turbochargers. 1.3 Observe turbocharger operation in accordance with service manual. 1.4 Check oil leakage and clogging.	TLE_IAAUS9-12SAI-IIIa-b-32
<ul style="list-style-type: none"> • Purpose of turbocharger • Tools and equipment used in dismantling turbocharger • Identification and evaluation of components • Interpretation of information from appropriate manufacturer’s specification • Procedure in overhauling turbocharger 			LO 2. Overhaul turbo charger. 2.1 Explain the functions and uses of turbocharger and components. 2.2 Identify the component parts. 2.3 (Explain function and uses of turbocharger components) delete above. 2.4 Observe safe handling procedures of turbocharger. 2.5 Overhaul turbocharger based on industry standard operating procedures.	TLE_IAAUS9-12SAI-IIIb-e-33

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
LESSON 10: SERVICING MECHANICAL SYSTEM - DIESEL FUEL INJECTOR (SDF)				
<ul style="list-style-type: none"> • Tools, materials and equipment used in overhauling the injector. • Identification and evaluation of components • Interpretation of specific information data by manufacturer specification • Perform overhauling of diesel fuel injector. • Types and application of fuel injector 	The learner demonstrates an understanding of concepts and underlying principles in servicing the diesel fuel system.	The learner independently performs servicing the diesel fuel system based on industry standard.	LO 1. Overhaul diesel fuel injector. <ol style="list-style-type: none"> 1.1 Identify component parts of diesel fuel injector. 1.2 Explain the function and uses of diesel fuel injector. 1.3 Observe safe handling of diesel fuel injector. 1.4 Determine diesel fuel injector standard specifications. 1.5 Dismantling fuel injector based on service manual. 	TLE_IIAUS9-12SDF-IIIIf-h-34
<ul style="list-style-type: none"> • Diesel fuel injector • Tools, materials equipment in calibrating and installing the injector • Diesel fuel test data • Diesel fuel manufacturer’s specification • Perform calibration and installation of diesel fuel injector 			LO 2. Calibrate and install diesel fuel injector. <ol style="list-style-type: none"> 2.1 Explain the calibration and installation process. 2.2 Observe testing sequence in accordance with the service manual. 2.3 Interpret test results according to repair manual. 	TLE_IIAUS9-12SDF-IIIIh-j-35
LESSON 11: SERVICING CLUTCH SYSTEM (SCL)				
<ul style="list-style-type: none"> • Clutch system types, components, functions and operation • Clutch failure/problem diagnosis <ul style="list-style-type: none"> - Clutch pedal goes to floorboard when depressed - Clutch slip when engaged - Clutch spine or drags while engaged - Clutch chatters or grabs while 	The learners demonstrate an understanding of concepts and underlying principles in servicing the clutch system.	The learner independently performs servicing the clutch system based on industry standard.	LO 1. Diagnose clutch failure/problem. <ol style="list-style-type: none"> 1.1 Check for clutch operation (transmission should engage and disengage smoothly). 1.2 Complete work using specified tools and equipment in accordance with the company standard operating procedures and manual of specifications. 1.3 Determine clutch problem following the service manual. 	TLE_IIAUS9-12SCL-IVa-b-36

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> being engaged - Clutch related vibration - Clutch area noises - Clutch pedal pulsation - Spongy clutch pedal 				
<ul style="list-style-type: none"> • Dismounting and mounting procedures • Bolt tightening sequence, pattern, and correct torque • Handling of special tools for dismounting & mounting • Precaution in handling hydraulic fluids and special tools • Apply personal safety procedures 			<p>LO 2. Pull out and mount clutch component parts.</p> <p>2.1 Dismount clutch component parts following the repair manual.</p> <p>2.2 Tighten bolts in correct torque and tightening sequence.</p> <p>2.3 Safety precautions in performing the task.</p>	<p>TLE_IAAUS9-12SCL-IVb-c-37</p>
<ul style="list-style-type: none"> • Types of clutch mechanism (hydraulic and mechanical) • Procedures in dismantling and installing clutch mechanism • Tagging/Marking of similar parts • Replacing damaged parts • Use of relevant tools and equipment • Apply personal safety procedures 			<p>LO3. Dismantle/install clutch mechanism.</p> <p>3.1 Mark similar parts accurately.</p> <p>3.2 Replace defective parts based on repair manual (pressure plate, friction disc, release bearing and pilot bearing).</p> <p>3.3 Follow installation procedures based on manufacturer's specification.</p> <p>3.4 Safety precautions in performing the task.</p>	<p>TLE_IAAUS9-12SCL-IVc-d-38</p>
<ul style="list-style-type: none"> • Procedures in overhauling hydraulic clutch mechanism • Procedures in checking hydraulic clutch parts • Replacing damaged parts 			<p>LO 4. Overhaul hydraulic clutch mechanism.</p> <p>4.1 Replace worn-out rubber cups and piston based on prescribed procedures.</p> <p>4.2 Check master cylinder.</p> <p>4.3 Check (valves) pistons for damage.</p> <p>4.4 Replace hydraulic valve mechanism based on repair manual.</p> <p>4.5 Test master cylinder and slave cylinder.</p>	<p>TLE_IAAUS9-12SCL-IVe-f-39</p>

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> Clutch parts failure analysis 			LO 5. Perform clutch parts failure analysis. 5.1 Identify failure accurately. 5.2 Recommend corresponding repair. 5.3 Analyze clutch parts based on service manual.	TLE_IAAUS9-12SCL-IVg-40
<ul style="list-style-type: none"> Procedures in adjusting clutch pedal free play Procedures in adjusting clutch finger height Special service tools in setting and adjusting clutch system components Clutch engaging and disengaging procedures 			LO 6. Set/adjust clutch system component. 6.1 Set clutch pedal free play based on manufacturer's specifications. 6.2 Adjust clutch finger height (coil spring type). 6.3 Use special service tools based on manufacturer's manual.	TLE_IAAUS9-12SCL-IVg-h-41
<ul style="list-style-type: none"> Checking fluid leakage, level and air lock Bleeding procedure Safety handling of brake fluid 			LO 7. Bleed clutch hydraulic system. 7.1 Perform fluid leakage, fluid level and air lock, based on manufacturer's manual. 7.2 Perform bleeding procedures based on manufacturer's specification. 7.3 Safety precautions in performing the task.	TLE_IAAUS9-12SCL-IVi-j-42
LESSON 12: OVERHAULING MANUAL TRANSMISSION (OMT)				
<ul style="list-style-type: none"> Types of transmission Principles of operation Components and parts of manual transmission Possible manual transmission failures. Diagnosing manual transmission failures. 	The learners demonstrate an understanding of concepts and underlying principles in overhauling manual transmission.	The learner independently performs overhauling manual transmission based on industry standard.	LO 1. Diagnose manual transmission failure. 1.1 Test manual transmission failures such as humming noise, shifting conditions, gear oil contamination, and gear oil leaks.	TLE_IAAUS9-12OMT-Ia-b-43

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Procedure in draining transmission gear oil • Procedure in pulling out manual transmission • Safety observance in doing transmission works • Procedure in mounting manual transmission 			<p>LO 2. Pull-out and mount manual transmission.</p> <p>2.1 Drain transmission gear oil.</p> <p>2.2 Position transmission to the transmission jack.</p> <p>2.3 Loosen bolts and nuts as per torque, sequence and pattern.</p> <p>2.4 Mount manual transmission.</p>	TLE_IAAUS9-12OMT-Ic-e-44
<ul style="list-style-type: none"> • Procedures in disassembling manual transmission and cleaning • Parts mark detailed position • Checking parts and component of manual transmission • Procedures in assembling manual transmission 			<p>LO3. Disassemble/assemble manual transmission.</p> <p>3.1 Disassemble transmission parts.</p> <p>3.2 Label transmission parts.</p> <p>3.3 Rinse transmission parts with appropriate solution.</p> <p>3.4 Clean component parts.</p> <p>3.5 Lubricate with new parts with gear oil.</p> <p>3.6 Replace damaged parts.</p> <p>3.7 Assemble transmission as per standard operating procedures.</p>	TLE_IAAUS9-12OMT-Ie-j-45
<ul style="list-style-type: none"> • Possible manual transmission troubles • Procedures in inspecting manual transmission internal components for defect • Procedures in replacing and repairing manual transmission parts 			<p>LO4. Inspect manual transmission parts.</p> <p>4.1 Inspect worn-out, cracked parts.</p> <p>4.2 Measure gear backlash and end play.</p> <p>4.3 Recommend possible remedies for the defective parts.</p> <p>4.4 Test transmission parts using testing instruments.</p> <p>4.5 Inspect transmission parts without causing damage.</p>	TLE_IAAUS9-12OMT-IIa-c-46
<ul style="list-style-type: none"> • Procedures in checking transmission gear oil • Check transmission mounting, linkages and attachments • Procedures in testing newly repaired manual transmission 			<p>LO 5. Test manual transmission.</p> <p>5.1 Check transmission oil after installation.</p> <p>5.2 Mount manual transmission.</p> <p>5.3 Install transmission linkages and attachments.</p> <p>5.4 Conduct transmission testing.</p>	TLE_IAAUS9-12OMT-IIc-h-47

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> Procedures in road testing transmission Procedures in test running newly repaired manual transmission 			LO 6. Road-test manual transmission. 6.1 Evaluate transmission performance with emphasis on shifting pattern, noise and operation.	TLE_IAAUS9-12OMT-IIh-j-48
LESSON 13: SERVICING DIFFERENTIAL AND FRONT AXLE (SDF)				
<ul style="list-style-type: none"> Construction and operation of front axle. Procedures in inspecting drive shaft and joints 	The learners demonstrate an understanding of concepts and underlying principles in servicing the differential and front axle.	The learner independently performs servicing the differential and front axle based on industry standard.	LO1. Inspect drive shaft and joint. 1.2 Inspect drive shaft for worn out cross joints, slip joint and propeller shaft.	TLE_IAAUS9-12SDF-IIIa-49
<ul style="list-style-type: none"> Procedures in removing differential assembly Tools and equipment in mounting and dismounting differential assembly Procedures in mounting differential 			LO2. Dismount and mount differential assembly. 2.1 Dismount differential assembly. 2.2 Apply penetrating oil on hold down clamp. 2.3 Mount differential assembly.	TLE_IAAUS9-12SDF-IIIb-c-50
<ul style="list-style-type: none"> Tools and equipment in dismantling differential parts Dismantling differential parts Analyzing and identifying defective parts and recommend repair action Replacing damaged parts Assemble and adjust differential as per manual instruction 			LO3. Overhaul differential. 3.1 Dismantle differential parts. 3.2 Identify defective parts. 3.3 Recommend corresponding repair for defective parts. 3.4 Clean and lubricate differential parts. 3.5 Replace damage differential parts. 3.6 Adjust differential based on the service manual. 3.7 Assemble differential.	TLE_IAAUS9-12SDF-IIIId-g-51
<ul style="list-style-type: none"> Identifying defective wheel hub and recommending corresponding repair works Replacing wheel bearing Setting/adjusting wheel bearing pre-load 			LO4. Overhaul rear/front wheel hub. 4.1 Identify defective parts as per service manual. 4.2 Recommend repair works. 4.3 Replace wheel bearing. 4.4 Adjust wheel bearing pre-load based on service manual.	TLE_IAAUS9-12SDF-IIIh-i-52

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> Identifying and corrective action recommended for failure in kingpin parts Tools and equipment in replacing damage kingpin Replacing damaged king pin parts Selecting and using of replacement parts 			LO5. Analyze king pin condition. 5.1 Identify king pin failures according to repair manual. 5.2 Recommend corrective actions. 5.3 Select replacement parts. 5.4 Replace damage king pin parts as per service instructions.	TLE_IAAUS9-12SDF-IIIj-53
<ul style="list-style-type: none"> Identifying I-beam failure and recommending corresponding repair works. Identifying and correcting I-beam alignment 			LO6. Inspect/replace I-beam. 6.1 Identify I-beam failure. 6.2 Recommend corresponding repair works. 6.3 Correct misalignment of I-beam based on industry standards.	TLE_IAAUS9-12SDF-IVj-54
LESSON 14: SERVICING STEERING SYSTEM (SSY)				
<ul style="list-style-type: none"> Parts and function of steering system Steering system components Caster, camber, toe, Steering axis Inclination, and tire angle Types and causes of tire wear Front end geometry Use of hydraulic and mechanical lifter Analyzing tire wear and front end geometry failure 	The learners demonstrate an understanding of concepts and underlying principles in servicing the steering system.	The learner independently performs servicing the steering system based on industry standard.	LO 1. Analyze front end geometry failure. 1.1 Perform visual inspection on tire wear and steering system. 1.2 Set-up wheel alignment equipment. 1.3 Adjust camber, caster and toe angles.	TLE_IAAUS9-12SSY-IVa-c-55
<ul style="list-style-type: none"> Pull outing/mounting steering component Dismantling/Installing steering component Steering component defects. Analyzing and replacing defective 			LO 2. Service steering system. 2.1 Pull out steering system components. 2.2 Disassemble steering system .components. 2.3 Identify steering system defects such as to deformation, cracks, tube leaks, and loose parts.	TLE_IAAUS9-12SSY-IVc-h-56

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parts.			2.4 Replace damaged parts based on service manual. 2.5 Assemble steering system.	
<ul style="list-style-type: none"> • Wheel balancing machine • Setting of wheel balancing machine • Locating and identifying wheel weight and size. • Use of tools and equipment for steering system servicing. • Tools and equipment safe handling. • Personal safety procedures. 			LO 3. Perform wheel balancing. 3.1 Set-up wheel balancing machine. 3.2 Identify wheel weight location and size.	TLE_IAAUS9-12SSY-IVh-i-57
<ul style="list-style-type: none"> • Checking condition of steering and suspension component • Positioning/installing wheel alignment equipment. • Interpreting equipment reading. • Conducting wheel alignment. 			LO 4. Conduct wheel alignment. 4.1 Check condition of steering system components. 4.2 Install wheel alignment equipment based on manufacturer’s manual. 4.3 Interpret equipment reading accurately based on manufacturer’s specifications. 4.4 Adjustment required is done based on manufacturer’s specifications. 4.5 Adjustment of wheel alignment is based on the results of the reading registered on the equipment.	TLE_IAAUS9-12SSY-IVi-j-58
LESSON 15: SERVICING MANUAL BRAKE SYSTEM (SMB)				
<ul style="list-style-type: none"> • Operating principles of brake system • Clearance adjusting procedure and specification. • Techniques in changing brake fluid, and filling-up to its correct level. 	The learners demonstrate an understanding of concepts and underlying principles in servicing manual brake system.	The learner independently performs servicing of ABS brake system based on industry standard.	LO 1. Perform brake system preventive maintenance. 1.1 Adjust brake clearance to specification (drum). 1.2 Change hydraulic brake fluid without spillage. 1.3 Fill assembly at specified level. 1.4 Perform bleeding of hydraulic system	TLE_IAAUS9-12SMB-Ia-e-59

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Brake hydraulic system bleeding steps and procedures. • Adjusting brake pedal height and pre-play specification and procedure. • Adjusting emergency brake linkage clearance and specification. • Safety precaution required in performing the job. 			<p>according to the required steps and procedure.</p> <p>1.5 Conduct brake pedal pre-play and height as per specification.</p> <p>1.6 Adjust emergency brake.</p> <p>1.7 Safety procedures in performing brake system tasks.</p>	
<ul style="list-style-type: none"> • Brake system linkages and brake lines. • Check master cylinder. • Checking wheel cylinder and disc brake caliper. • Brake booster operation • Checking brake booster • Brake troubles 			<p>LO2. Diagnose brake system failure.</p> <p>2.1 Check brake system linkages.</p> <p>2.2 Check brake lines for bends and leaks.</p> <p>2.3 Check master cylinder according to required steps and procedures.</p> <p>2.4 Check power booster according to required steps and procedures.</p> <p>2.5 Check wheel cylinder/ caliper accurately.</p> <p>2.6 Observe personal safety procedure throughout the activity.</p>	<p>TLE_IIAUS9-12SMB-If-h-60</p>
LESSON 16: SERVICING ABS BRAKE SYSTEM (SBS)				
<ul style="list-style-type: none"> • Component of hydraulic brake (ABS) • Principle of operation of hydraulic brake (ABS) • Types and classification of brakes (ABS) 	<p>The learners demonstrate an understanding of concepts and underlying principles in servicing ABS brake system.</p>	<p>The learner independently performs servicing of ABS brake system based on industry standard.</p>	<p>LO 1. Identify the types of hydraulic brake (hydraulic abs) and its corresponding component and function.</p> <p>1.1 Explain functions of brakes system.</p> <p>1.2 Identify components of brake system.</p> <p>1.3 Explain operating principles of hydraulic brake system</p> <p>1.4 Classify types of braking system.</p>	<p>TLE_IIAUS9-12SBS-Ih-j-61</p>
<ul style="list-style-type: none"> • Operating principle of BOSCH ABS • Operating principle of TEVES ABS • Checking electronic control Unit (ECU) 			<p>LO 2. Explain the operating principle of abs equipped brake.</p> <p>2.1 Explain operating principles of BOSCH ABS.</p> <p>2.2 Explain operating principles of TEVE ABS.</p>	<p>TLE_IIAUS9-12SBS-Ij-IIa-b-62</p>

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Checking sensors and actuators • Checking ABS hydraulic pump 			2.3 Explain how to check ECU Illustrate how to check sensors and actuator.	
<ul style="list-style-type: none"> • Japan ABS schematic diagram. • European ABS schematic diagram • American ABS circuit diagram. 			LO3. Interpret schematic diagram and circuitry. 3.1 Interpret Japan ABS schematic diagram. 3.2 Interpret European ABS schematic diagram. 3.3 Interpret American ABS circuit diagram.	TLE_IAAUS9-12SBS-IIb-c-63
<ul style="list-style-type: none"> • Checking ABS hydraulic pump • Checking ABS wheel sensor • Circuit tracing ABS wiring diagram 			LO 4. Perform ABS component testing. 3.1 Check ABS voltage based on specifications. 3.2 Check fluid pressure. 3.3 Check amperage draw according to manufacturer’s specifications. 3.4 Test/check wiring circuit. 3.5 Use appropriate tools and equipment. 3.6 Observe personal, vehicle and workshop safety procedures while working.	TLE_IAAUS9-12SBS-IIc-e-64
LESSON 17: OVERHAULING BRAKE SYSTEM (OBS)				
<ul style="list-style-type: none"> • Operating principles of brake system • Brake system types and components • Hydraulic brake system fluid • Changing hydraulic fluid • Personal safety procedures • Pullout and mount brake system 	The learner demonstrates an understanding of concepts and underlying principles in overhauling brake system.	The learner independently performs overhauling of brake system based on industry standard.	LO 1. Pull-out/mount brake system components. 1.1 Pull out brake system components as per service manual. 1.2 Mount brake system components according to repair manual. 1.3 Label brake system components for mastery.	TLE_IAAUS9-12OBS-IIf-g-65
<ul style="list-style-type: none"> • Procedure in dismantling brake system component • Replacing damaged parts • Assembling brake components in 			LO2. Disassemble/assemble brake system components. 2.1 Disassemble brake system components. 2.2 Label brake system components.	TLE_IAAUS9-12OBS-IIh-i-66

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<p>accordance with industry standards</p> <ul style="list-style-type: none"> • Testing brake system components • Applying personal safety in disassembling hydraulic parts • Using accurate tools for the job. 			<p>2.3 Rinse brake system parts with specified cleaning solutions.</p> <p>2.4 Identify damaged parts according to service manual.</p> <p>2.5 Replace damaged parts as per repair manual.</p> <p>2.6 Test brake system components.</p>	
<ul style="list-style-type: none"> • Pre starting check-up • Driving techniques • Vehicle safety requirements. • Recording findings 			<p>LO 3. Conduct road test.</p> <p>3.1 Perform pre-testing check-up prior to vehicle operation.</p> <p>3.2 Observe brake trouble while vehicle is driven at specified speed.</p> <p>3.3 Record and interpret findings.</p> <p>3.4 Recommend remedies on discovered findings.</p>	<p>TLE_IAAUS9-12OBS-IIj-67</p>
LESSON 18: SERVICING SUSPENSION SYSTEM (SSU)				
<ul style="list-style-type: none"> • Principles and operation of conventional (and air suspension) system • Types of suspension system • Parts and function of conventional and air suspension system • Causes and remedies of air suspension failure • Balancing air suspension • Replacement of air suspension defective parts • Air suspension must not be included since it used for huge cars like buses and trucks 	<p>The learner demonstrates an understanding of concepts and underlying principles in servicing the suspension system.</p>	<p>The learner independently performs servicing the suspension system based on industry standard.</p>	<p>LO1. Diagnose suspension system failure.</p> <p>1.1 Explain principles and operation of conventional and air suspension system.</p> <p>1.2 Identify the parts of conventional and air suspension system.</p> <p>1.3 Identify causes of failures in the suspension system.</p> <p>1.4 Recommend repair works on the identified failures.</p>	<p>TLE_IAAUS9-12SSU-IIIa-b-68</p>

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Tools and equipment in dismounting and mounting suspension system • Procedure in dismounting and mounting suspension system • Safety procedure in working with suspension system • Interpret repair manual procedures and specification 			<p>LO2. Dismount/mount suspension component parts.</p> <p>2.1 Dismount and mount suspension components as per service manual.</p> <p>2.2 Label dismounted parts.</p> <p>2.3 Safety precautions in dismounting/mounting suspension system components.</p>	<p>TLE_IAAUS9-12SSU-IIIc-e-69</p>
<ul style="list-style-type: none"> • Procedures in disassembling and assembling suspension system components • Safety procedures in working with suspension system • Interpret repair manual procedures and specifications 			<p>LO3. Disassemble/assemble suspension parts.</p> <p>3.1 Disassemble /assemble suspension parts based on repair manual.</p> <p>3.2 Rinse disassembled parts with cleaning solution.</p> <p>3.3 Apply safety precautions when performing the task.</p>	<p>TLE_IAAUS11-1SSU-2IIIe-h-70</p>
<ul style="list-style-type: none"> • Inspect for defective suspension parts • Replacing defective parts • Procedures in removal and installation of suspension components • Methods of inspection in every component 			<p>LO4. Inspect/replace suspension component parts.</p> <p>4.1 Check suspension system for cracks, loose nuts, bolts, bushing and leaks as to service manual.</p> <p>4.2 Identify damaged parts.</p> <p>4.3 Replace damaged parts based on repair manual.</p>	<p>TLE_IAAUS9-12SSU-IIIi-j-71</p>
LESSON 19: PERFORMING UNDERCHASSIS PREVENTIVE MAINTENANCE (PUP)				
<ul style="list-style-type: none"> • Clutch/brake fluid levels and lines • Clutch/brake line cracks, twists, bends, looseness and restrictions • Master cylinder fluid low level • Safe handling of hydraulic fluid • Hazards associated with the use of brake fluid 	<p>The learner demonstrates an understanding of the concept of performing under chassis preventive maintenance.</p>	<p>The learner independently performs under chassis preventive maintenance.</p>	<p>LO 1. Check clutch and brake fluid and lines.</p> <p>1.1 Check clutch/brake fluid level and lines for leakage.</p> <p>1.2 Check clutch/brake lines for cracks, twists, bends, looseness and restrictions.</p> <p>1.3 Refill clutch/brake master cylinder with</p>	<p>TLE_IAAUS9-12PUP-IVa-b-72</p>

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
			brake fluid to the specified level. 1.4 Replace defective clutch/brake system components in accordance with manufacturer's specification. LO 1.2 Inspect/bleed brake and clutch system.	
<ul style="list-style-type: none"> • Inspecting changing transmission gear oil • Inspecting or changing differential gear oil • Checking leakage of gear oil • Refilling gear oil • Observing safety procedures 			LO 2. Inspect and change transmission/differential gear oil. 2.1 Check transmission /differential for leakage. 2.2 Check transmission /differential gear oil level. 2.3 Change transmission /differential gear oil in accordance with manufacturer's specification. 2.4 Refill transmission/differential gear oil to specified level.	TLE_IAAUS9-12PUP-IVc-d-73
<ul style="list-style-type: none"> • Inspecting power steering fluid level • Replacing power steering fluid • Gathering technical data • Inspecting leakage on linkages 			LO 3. Inspect/replace power steering fluid. 3.1 Read technical data pertaining to power steering. 3.2 Check power steering fluid level. 3.3 Inspect power steering for leakage. 3.4 Replace power steering fluid in accordance with manufacturer's specification.	TLE_IAAUS9-12PUP-IVe-f-74
<ul style="list-style-type: none"> • Automatic transmission fluid specifications • Automatic transmission fluid level • Hazards and safe handling of automatic transmission fluid (ATF) • Check leakage for automatic transmission • Refill transmission fluid 			LO 4. Check/refill automatic transmission fluid. 4.1 Check automatic transmission for leakage. 4.2 Check automatic transmission fluid following instructions in service manual. 4.3 Refill transmission fluid to specified level.	TLE_IAAUS9-12PUP-IVg-h-75

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CONTENT	CONTENT STANDARD	PERFORMANCE STANDARD	LEARNING COMPETENCIES	CODE
<ul style="list-style-type: none"> • Determine causes of abnormalities • Check tire and tire pressure • Check tire studs • Check wheel nuts and bolts • Inspect tire for solid object struck • Inspect tire wear and deformities 			<p>LO 5. Check tire and tire pressure.</p> <p>5.1 Inspect tires for stuck solid objects.</p> <p>5.2 Inspect tires for wear and deformities.</p> <p>5.3 Determine causes of abnormal tire wear.</p> <p>5.4 Check tire pressure in accordance with manufacturer’s specifications.</p>	<p>TLE_IAAUS9-12PUP-IVi-j-76</p>

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RESOURCES			LEARNING MATERIALS	COURSE DELIVERY
TOOLS	EQUIPMENT	MATERIALS		
<ul style="list-style-type: none"> • Box wrench • Socket wrench • Pliers • Screw driver • Wire stripper • Mechanic’s hammer • Apron • Goggle • Gloves • Torque wrench • Feeler gauge • Battery tester • Hydrometer • Dial gauge • Bore gauge • Micrometer caliper • Jump starter cable • Air impact tools • Coil spring compressor • Belt tension gauge • Steel rule • Pull push rule • Grease gun • Oiler • Thermostat pressure gauge • Oil filter wrench • Fender cover • Nozzle tester • Transmission jack • Floor jack • Car lift • Pullers • Rubber mallet • Clutch aligning tool • Snap ring pliers 	<ul style="list-style-type: none"> • Hydraulic jack/lift • Running condition vehicle • Growler tester • Ignition timing light • Tachometer • Wheel balancer • Wheel aligning equipment • Air compressor • Wash rack • Multi-meter • Vehicle 	<ul style="list-style-type: none"> • Grease • Engine oil • Sealant/Adhesive • Hydraulic oils/Gear oil • Automatic transmission fluid • Wheel wedges • Test lamp • PPE • Solvent • Sand paper • Brake fluid • Coolant • Power steering fluid • Rugs • Tool rack • Battery • Electrical Tape • Oil filter • Grease 	<ul style="list-style-type: none"> • Modules • Brochures • Catalogues • API Manual • Hand outs • Learning Guides • Wheel balancing accessories • Oil pump • Occupational Health and Safety rules • Power point presentations • Manufacturer’s specification • Repair manual • Brake mock-up with ABS • Vehicle with BOSCH ABS • Vehicle with TEVES ABS • Electronic control unit (ECU) • Sensors and actuators • Motor Vehicle • Multimeter (digital) • Battery • ECU diagnostic connector • Japan ABS schematic diagram and circuitry • European ABS schematic diagram and circuitry. • American ABS circuit diagram. • Car equipment with ABS brakes. • Turbo charger • Engine mock-up with turbocharger • Injection pump calibrating machine • Differential and front axle • Cut-out of Turbocharger 	<ul style="list-style-type: none"> • Modular • Demonstration • Lecture • Discussion • Dual training • Distance learning • Group work • Interaction • Role playing • Symposium • Group dynamics • Film viewing <p>Assessment Method</p> <ul style="list-style-type: none"> • Written examination • Demonstration • Practical test • Direct observation • Interview • Case study • Simulation • Portfolio assessment • Situation analysis

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RESOURCES			LEARNING MATERIALS	COURSE DELIVERY
TOOLS	EQUIPMENT	MATERIALS		
<ul style="list-style-type: none"> • Vehicle stand support 			<ul style="list-style-type: none"> • Injection nozzle • Injection pump • Clutch replacement arts • Kingpin • Cross joint • I-beam mock-up • Gasoline engine mock-up • Diesel engine mock-up • Starting System mock-up • Charging system mock-up • Model parts of cooling system • Water pump • Maintenance manual • Inventory of tools and materials • Writing materials • Reference Books • Computers • CDs, tapes, transparency • Company policies and standards • Clean air act • Waste management • Disaster preparedness and management • Electrical and fire safety codes • Record book • OHS personal records • Labeling materials 	

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GLOSSARY

- | | | | |
|-----|-------------------------------|---|--|
| 1. | Light Duty Vehicles | - | Motor vehicles whose gross vehicle weight is equal or less than 3,500 kgs. Powered by a gas or diesel engine. |
| 2. | Automotive Service Technician | - | All around auto serviceman that can perform both mechanical and electrical as well as auto electronics maintenance checking and inspection of motor vehicle. Assesses vehicle problems, perform all necessary diagnostic test or installation of accessories and competently repairs or replaces faulty parts. |
| 3. | Adhesives | - | Substance used to hold gasket in place during assembly. It also maintains a tight seal by filling in small irregularities on a surface and prevents gasket from shifting due to vibration. |
| 4. | Anti-Lock Braking System | - | System that automatically controls wheel slip or prevents sustained wheel locking on braking |
| 5. | Automatic Transmission | - | A transmission in which gear or ratio changes are self-activated, eliminating the necessity of hand shifting gears |
| 6. | Backlash | - | Amount of clearance or play between two meshed gears |
| 7. | Catalytic Converter | - | Control device fitted in the exhaust system of an internal combustion engine. The converter reduces the toxicity of products of combustion by catalytic re-combination |
| 8. | Charcoal Canister | - | Trap containing charcoal granules to store fuel evaporating from a fuel system and prevent its loss to atmosphere, particularly from a carburetor and fuel tank. |
| 9. | Electronics | - | Electrical assemblies, circuit and system that use electronic devices such as transistors and diodes. |
| 10. | Emissions | - | Any air contaminant, pollutant, gas stream from a known source which is introduced into the atmosphere. |
| 11. | Final Drive | - | The end of the drive train before power is transmitted to the wheels. |
| 12. | Fuel Injection | - | An electronic system that increases the performance and fuel economy because it monitors engine conditions and provides the correct air/fuel mixture based on the engine's demand. It injects fuel directly into the cylinder head enabling more precise control over the quantity used. |
| 13. | Governor | - | A speed sensing device that employs centrifugal force and spring tension to govern engine speed. |
| 14. | Hotchkiss Drive | - | Type of rear suspension in which leaf springs absorbs the rear axle housing torque. |
| 15. | Intake Manifold | - | Tubing attached to the engine through which the air/fuel mixture reaches the cylinder. |
| 16. | Ignition System | - | Electrical system devised to produce timed sparks from engine spark plug. Consisting of a battery, induction coil, capacitor, distributor, spark plugs and relevant switches and wiring. |
| 17. | Master Cylinder | - | Liquid-filled cylinder in the hydraulic brake system or clutch, where hydraulic pressure is developed when depresses a foot pedal. |
| 18. | Periodic Maintenance Service | - | Regular servicing prescribed by manufacturer to maintain the vehicle's top performance |
| 19. | Positive Crank Ventilation | - | Emission control system that prevents crank case gases from entering the atmosphere, usually by drawing the gases from the crank case and feeding them into the engine's induction system. |
| 20. | Power Steering | - | Steering that has been designed to make the wheel move more easily than in a manual steering system. Hydraulic assists the process utilizing hydraulic fluid. The fluid increases pressure in the power steering pump and aids in the movement of the steering mechanism. This fluid, called power steering fluid, is what is replaced at regular intervals to keep steering soft and comfortable. |
| 21. | Super Charged Engine | - | An engine that is similar to a turbo-charged engine which uses a series of belts or chains from the crankshaft to turn the turbines that forces the air/fuel mixture into the cylinder heads under pressure creating a bigger explosion which generates more power. A turbocharger uses the exhaust gases to turn the turbines to create the same effect. |
| 22. | Transaxle | - | Type of construction in which the transmission and differential are combined in one unit. |
| 23. | Thermostat | - | A device for automatic regulation of temperature |

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- 24 Turbo Charged Engine
 - A performance-increasing turbine positioned in the exhaust system. Expanding exhaust gases spin an impeller (very small fan-type blades) at speeds up to 25 thousand rpm, driving a similar compressing impeller. Compressed air from the driven impeller is forced into the induction system, which squeezes more air/fuel mixture into the combustion chambers. With the greater charge of air and fuel, a more powerful combustion burn results, thus more power. The big advantage of the turbo over directly driven superchargers is the increased efficiency, although there is a slight lag before the turbine spins up and increases the power output. Originally turbo were developed to enable aircraft to fly at high altitudes, then they found use in diesel trucks and train engines to increase their torque.

- 25 U-joint
 - A four-joint cross-connected to two U-shaped yokes that serve as a flexible coupling between shafts.

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CODE BOOK LEGEND

Sample: **TLE_IAAUS9-12SAB-Ia-b-1**

LEGEND		SAMPLE	
First Entry	Learning Area and Strand/ Subject or Specialization	Technology and Livelihood Education_Industrial Arts Automotive Servicing	TLE_IAAUS9-12
	Grade Level	9/10/11/12	
Uppercase Letter/s	Domain/ Content/ Component/ Topic	Servicing Automotive Battery	SAB
			-
Roman Numeral <i>*Zero if no specific Quarter</i>	Quarter	First Quarter	I
Lower case letter/s <i>*Put an en-dash (-) in between letters to indicate more than a specific week</i>	Week	Weeks one to two	a-b
			-
Arabic Number	Competency	Explain the operation and safe handling of different types of batteries.	1

DOMAIN / COMPONENT	CODE
Servicing Automotive Battery	SAB
Servicing Ignition System	SIS
Testing and Repairing Wiring/Lighting System	TRW
Servicing Starting System	SSS
Servicing Charging System	SCH
Servicing Mechanical System - Cooling System	SCS
Servicing Mechanical System - Lubricating System	SLS
Servicing Mechanical System -Gasoline Fuel System	SGF
Servicing Mechanical System - Air Induction System	SAI
Servicing Mechanical System - Diesel Fuel Injector	SDF
Servicing Clutch System	SCL
Overhauling Manual Transmission	OMT
Servicing Differential and Front Axle	SDF
Servicing Steering System	SSY
Servicing Manual Brake System	SMB
Servicing ABS Brake System	SBS
Overhauling Brake System	OBS
Servicing Suspension System	SSU
Performing Underchassis Preventive Maintenance	PUP

Technology-Livelihood Education and Technical-Vocational Track specializations may be taken between Grades 9 to 12.

Schools may offer specializations from the four strands as long as the minimum number of hours for each specialization is met.

Please refer to the sample Curriculum Map on the next page for the number of semesters per Industrial Arts specialization and those that have pre-requisites. Curriculum Maps may be modified according to specializations offered by a school.

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SAMPLE INDUSTRIAL ARTS CURRICULUM MAP** (as of November 2015)

GRADE 7/8 (EXPLORATORY)				GRADES 9-12			
				Automotive Servicing (NC I)+			8 sems
				*Automotive Servicing (NC II)			8 sems
				Motorcycle/Small Engine Servicing (NC II)	4 sems	Drivina (NC II)	2 sems
				Consumer Electronics Servicing (NC II)+			8 sems
				*Mechatronics Servicing (NC II)			4 sems
				Electronic Products Assembly and Servicing (NC II)++			8 sems
				*Instrumentation Control and Servicing (NC II)			4 sems
				Electrical Installation and Maintenance (NC II)			8 sems
				*Electrical Power Line Distribution Line Construction (NC II)			4 sems
				*Transmission Line Installation and Maintenance (NC II)			4 sems
				Machining (NC I)++			8 sems
				*Machining (NC II)			8 sems
				Plumbing (NC I)	4 sems	*Plumbing (NC II)	4 sems
				Domestic Refrigeration and Airconditioning Servicing (NC II)			8 sems
				*Domestic Refrigeration and Airconditioning Servicing (PACU/CRE) (NC III)			8 sems
				Shielded Metal Arc Welding (NC I)	4 sems	*Shielded Metal Arc Welding (NC II)	4 sems
						*Gas Metal Arc Welding (GMAW) (NC II)	4 sems
						*Gas Tungsten Arc Welding (GTAW) (NC II)	4 sems
				Carpentry (NC II)			8 sems
				*Carpentry (NC III)	4 sems	Construction Painting (NC II)	2 sems
				Furniture Making (Finishing) (NC II) +			6 sems
				Masonry (NC II)	4 sems	Tile Setting (NC II)	4 sems
			4 sems				

EXPLORATORY

* Please note that these subjects have pre-requisites mentioned in the CG.
 Other specializations with no pre-requisites may be taken up during these semesters.
 Pre-requisites of the subjects to the right should be taken up during these semesters.

+ CG to be updated by December 2015 ++ CG to be updated by December 2015

****This is just a sample. Schools make their own curriculum maps considering the specializations to be offered. Subjects may be taken up at any point during Grades 9-12.**