Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

BASIC HYDRAULIC AND PNEUMATIC SYSTEMS

AUTHP501

Competence: Apply basic hydraulic and pneumatic systems

RQF Level: 5

Learning Hours

110

Credits: 11

Sector: **Transport and logistics**

Trade: **Automobile Technology**

Module Type: **Specific**

Curriculum: **TRLAUT 5001- TVET Level 5 in Automobile Technology**

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<table>
<tr><td>Purpose statement</td><td colspan="6">This module describes the knowledge, skills and attitude required to apply basic of hydraulic and pneumatic systems. It is intended to be pursued by learners at TVET certificate level V in automobile technology. At the end of this module, the trainee will be able to describe hydraulic system, describe pneumatic system, describe hydraulic and pneumatic circuits.</td></tr>
<tr><td>Learning assumed to be in place</td><td colspan="6">N/A</td></tr>
<tr><td rowspan="8">Delivery modality</td><td colspan="2">Training delivery</td><td>100%</td><td colspan="2">Assessment</td><td>Total 100%</td></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="4">Formative assessment</td><td>30%</td><td rowspan="4">100%</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>• Group project and presentation</td><td>20%</td></tr>
<tr><td>• Individual project /Work</td><td>50%</td></tr>
<tr><td colspan="2"></td><td colspan="2">Summative Assessment</td><td>N/A</td></tr>
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Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. **Describe hydraulic system.**	1.1. Hydraulic principles are properly described.
	1.2. Hydraulic fluids are properly described based on their types
	1.3. Hydraulic system components and their symbols are adequately described
2. **Describe pneumatic system**	2.1. Pneumatic principles are appropriately described.
	2.2. Pneumatic components are adequately identified.
	2.3. Pneumatic system components and their symbols are appropriately described.
3. **Describe hydraulic and pneumatic circuits**	3.1. Hydraulic and pneumatic circuits are properly drawn according ISO standards.
	3.2. Hydraulic circuits are correctly described
	3.3. Pneumatic circuits are correctly described based on compressed air brake system

Course content

Learning outcomes	At the end of this module the learner will be able to: 1. Describe hydraulic system. 2. Describe pneumatic system. 3. Describe hydraulic and pneumatic circuits
Learning outcome 1: Describe hydraulic system.	**Learning hours: 25**
Indicative content	

- **Description of hydraulic principles**
  - ✓ Pascal's law
  - ✓ Pressure and force
  - ✓ Simple hydraulic system components
  - ✓ Advantages and disadvantages of hydraulic system.
  - ✓ Operating principle of hydraulic system
  - ✓ Classification of hydraulic system.

- **Description of hydraulic fluid types**
  - ✓ Synthetic hydraulic fluid
  - ✓ Mineral hydraulic fluid/Petroleum based fluid
- **Description of hydraulic system components and their symbols.**
  - ✓ Hydraulic power pack
    - Tank
    - Filter
    - Pump
    - Prime mover
    - Pressure regulator
  - ✓ Hydraulic system controllers
    - Pressure control valves
    - Direction control valves (DCV)
    - Volume control valves
  - ✓ Hydraulic system actuators
    - Linear
    - Semi-rotary
    - Rotary
  - ✓ Hydraulic accessories
    - accumulators
    - heat exchangers
    - coolers
    - fluids
    - pipes, hoses and connectors
    - pressure gauges.
    - Seals

Resources required for the learning outcome	
• **Equipment**	Black board, Projector, Computer, dustpan, Air compressor, Hydraulic press, vehicle, hydraulic equipment, Jack stand, Bench vice, Work bench, PPE.
• **Materials**	Anti-rust, Water, Powder soap, liquid soap, Hydraulic fluid, Sandpapers, hydraulic system components.
• **Tools**	Spanners, Screw drivers, Hummers, Pliers, Punches and chisels, Cutters, Scraper, Bolts extractors, Brushes, Hack saw, Air impact spanners, Air brow gun, Drilling machine (portable), Angle grinding machine.
• **Facilitation techniques / learning activities**	• Group discussion • Trainer guided. • Brainstorming • Simulation • Demonstration
• **Formative assessment methods**	• Written based assessment • Oral based assessment

Learning outcome 2: Pneumatic system description.	**Learning hours: 25**
Indicative content	
• **Description of pneumatic principles** ✓ Properties of air ✓ Statement of Pascal's law ✓ The basic gas laws • **Identification of pneumatic circuit components** ✓ Energy supply components ✓ Control components ✓ Transmission components • **Description of pneumatic components and their symbols** ✓ Energy supply components ✓ Control components ✓ Transmission components	
Resources required for the indicative content	
Equipment	Black board, Projector, Computer, dustpan, Air compressor. Hydraulic press, vehicle, pneumatic equipment, Jack stand, Bench vice, Work bench, PPE
Materials	Anti-rust, Water, Powder soap, liquid soap, Hydraulic fluid, Sandpapers, pneumatic system components.

Tools	Spanners, Screw drivers, Hummers, Pliers, Punches and chisels, Cutters, Scraper, Bolts extractors, Brushes, Hack saw, Air impact spanners, Air brow gun, Drilling machine (portable), Angle grinding machine.
Facilitation techniques / learning activities	• Group discussion • Trainer guided. • Brainstorming • Simulation • Demonstration
Formative assessment methods	• Written based assessment • Oral based assessment

Learning outcome 3: Hydraulic and pneumatic circuit interpretation	**Learning hours: 60**
Indicative content	
• **Drawing of hydraulic and pneumatic circuit** ✓ Hydraulic circuit ✓ Pneumatic circuit • **Description of hydraulic circuit** ✓ Basic hydraulic circuit ✓ Open hydraulic circuit ✓ Closed hydraulic circuit • **Description of pneumatic circuit** ✓ Single-circuit, power assisted compressed-air brake system (low pressure) with mechanical parking brake ✓ Dual circuit, compressed-air power brake system (low pressure) with mechanical parking brake ✓ Dual circuit, compressed-air power brake system (low pressure) with no linkage parking brake ✓ Dual circuit, compressed-air power brake system (High pressure) with no linkage parking brake ✓ Dual circuit, compressed-air power brake system (low pressure) with pneumatic suspension, pneumatic door control and no linkage parking brake ✓ Dual circuit, dual line compressed-air power brake (low pressure) for trailer operation with no linkage parking brake. ✓ Single circuit, dual line compressed-air trailer power-brake system (low pressure) With mechanical parking brake	
Resources required for the indicative content	
Equipment	Black board, Projector, Computer, dustpan, Air compressor. Hydraulic press, vehicle, pneumatic equipment, Jack stand, Bench vice, Work bench, PPE

Materials	Anti-rust, Water, Powder soap, liquid soap, Hydraulic fluid, Sandpapers, pneumatic system components.
Tools	Spanners, Screw drivers, Hummers, Pliers, Punches and chisels, Cutters, Scraper, Bolts extractors, Brushes, Hack saw, Air impact spanners, Air brow gun, Drilling machine (portable), Angle grinding machine.
Facilitation techniques and learning activities	• Group discussion • Trainer guided. • Brainstorming • Simulation • Demonstration
Formative assessment methods	• Written based assessment • Oral based assessment

References:

1. Applied hydraulics and pneumatics by V. JAYAKUMAR, 2009, Anna University
2. Basics of Fluid Mechanics, Genick Bar Meir, Ph. D.7449 North Washtenaw Ave Chicago, IL 60645Version (0.3.1.1 December 21, 2011)
3. Hydraulic troubleshooting, Rob Shepherd, and Terry Mullen
4. Hydraulics and Pneumatics, ISBN: 0750644192, Publisher: Elsevier Science & Technology Books, Pub. Date: March 1999.
5. MODERN DIESEL TECHNOLOGY: HEAVY EQUIPMENT SYSTEMS 2ND EDITION by Robert Huzij, Angelo Spano, Sean Bennett 2014
6. Pneumatic Control for Industrial Automation by Gordon Smith and Peter Rohner 1988