Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

TELECOMMUNICATION SYSTEMS FUNDAMENTALS

ETETF302

APPLY TELECOMMUNICATION SYSTEMS FUNDAMENTALS

Competence

RQF Level: 3

Learning Hours 60

Credits: 6

Sector: Technical Services

Trade: Electronics and Telecommunication

Module Type: General

Curriculum: TSVETE3001-TVET Level 3 in Electronics and Telecommunication

Issue Date: April 2022

<table>
<tr><td>Purpose statement</td><td colspan="6">To effectively apply practical skills, trainees need theoretical background about the technologies and devices to be used. The role of this module is to equip trainees with the necessary theoretical knowledge and skills about telecommunication systems, transmission media, modulation, demodulation and basics of networking.</td></tr>
<tr><td>Learning to be assumed in place</td><td colspan="6">N/A</td></tr>
<tr><td rowspan="6">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">50%</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="3"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
</table>

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. Describe telecommunication systems	1.1. Telecommunication systems are described according to their classifications
	1.2. Elements of Telecommunication system are clearly explained considering their applications
	1.3. Telecommunications equipment and devices are adequately described according to their applications.
	1.4. Signal Waveforms are clearly explained according to their type
	1.5. Frequency spectrum bands are clearly differentiated according to their application
2. Use transmission media	2.1. Transmission media are clearly identified according to their types and Applications
	2.2. Transmission media are adequately used/utilized according to their standards
	2.3. Transmission media are adequately utilized according to their applications
	3.1. Network types are clearly differentiated according to their size

3. Apply Networking skills	3.2. Network devices are clearly described according to their applications
	3.3. Network topologies are clearly identified according to their types
	3.4. Local Area Network is practically created and tested according to the standards
4. Apply modulation/ Demodulation and Multiplexing/ Demultiplexing Techniques	4.1. Modulation and Demodulation techniques are clearly identified based on their applications.
	4.2. Multiplexing and Demultiplexing techniques are clearly identified based on their applications.
	4.3. Modulation and Demodulation techniques are practically implemented respecting their applications.
	4.4. Multiplexing and Demultiplexing techniques are practically implemented respecting their applications.

Course content

Learning outcomes	**At the end of the module the learner will be able to:** 1. Describe telecommunication systems 2. Use transmission media 3. Apply Networking skills 4. Apply modulation/ Demodulation and Multiplexing/ Demultiplexing Techniques
Learning outcome 1: Describe telecommunication systems	**Learning hours: 20**

Indicative content

- **Identification of telecommunication systems**
  - ✓ Wireless systems
  - ✓ Wired systems
- **Explanation of elements of telecommunication system**
  - ✓ Transmitter
  - ✓ Communication channel
  - ✓ Receiver
  - ✓ Noise types
- **Description of telecommunication equipment**
  - ✓ Mobile communication equipment and devices
  - ✓ Satellite communication equipment and devices
  - ✓ Broadcasting equipment and devices
  - ✓ Network devices
- **Explanation of signal waveforms**
  - ✓ Types of waveforms
  - ✓ Waveform parameters
  - ✓ Waveforms Generation
- **Differentiation of frequency spectrum bands**
  - ✓ Types of frequency spectrum bands and their application

Resources required for the learning outcome	
Equipment	Computers, Projector, Projection screen, Printers, Multimeter, Oscilloscope, Function generator
Materials	Chalks, Pens, Books, Papers, Flip-chart
Tools	Internet access, Voltage tester
Facilitation techniques & learning activities	● Demonstration and simulation ● Individual and group work ● Practical exercise ● Individualized ● Trainer guided ● Group discussion
Formative assessment methods	● Written assessment ● Oral presentation ● Performance assessment ● Product based assessment ● Project based assessment

Learning outcome 2: Use transmission media	Learning hours: 15
Indicative content	
• **Description of transmission media** ➢ Guided media ➢ Unguided media • **Set up and manipulation of guided media** • **Set up and manipulation of unguided media**	
Resources required for the indicative content	
Equipment	Computers, Projector, Projection screen, Printers, Multimeter
Materials	Chalks, Pens, Books, Papers, Flip-chart, Coaxial cable, Fiber optics, Ethernet cable, Wireless adapter, Coaxial connectors, RJ45 connector, Fiber optics connectors, Splicing machine
Tools	Internet access, cables Crimping Tool
Facilitation techniques & learning activities	• Demonstration and simulation • Individual and group work • Practical exercise • Individualized • Trainer guided • Group discussion
Formative assessment methods	• Written assessment • Oral presentation • Performance assessment • Product based assessment • Project based assessment

Learning outcome 3: Apply Networking skills	Learning hours: 15

Indicative content
• **Differentiation of networks** ✓ LAN ✓ PAN ✓ WLAN ✓ MAN ✓ WAN ✓ VPN ✓ VLAN • **Description of network devices** ✓ Hub ✓ Switch ✓ Router ✓ Bridge ✓ Gateway ✓ Modem ✓ Repeater ✓ Access Point • **Explanation of network topologies** ✓ Mesh Topology ✓ Star Topology ✓ Bus Topology ✓ Ring Topology ✓ Tree Topology ✓ Hybrid Topology • **Creation and testing of a LAN and a WLAN** ✓ Interconnection of nodes ✓ Network setting up ✓ Network testing
Resources required for the indicative content

Equipment	Computers, Projector, Projection screen, Printers, Network Switch, Router, Modem, Access Point, Multimeter
Materials	Chalks, Pens, Books, Papers, Flip-chart, Ethernet cable, RJ45 connector
Tools	Internet access, CABLES Crimping Tool
Facilitation techniques & learning activities	● Demonstration and simulation ● Individual and group work ● Practical exercise ● Individualized ● Trainer guided ● Group discussion
Formative assessment methods	● Written assessment ● Oral presentation ● Performance assessment ● Product based assessment ● Project based assessment

Learning outcome 4: Apply modulation/ Demodulation and Multiplexing/ Demultiplexing Techniques	Learning hours: 10
Indicative content	
• **Description of modulation and demodulation** ✓ Types of modulation ✓ Types of demodulation • **Description of multiplexing and demultiplexing** ✓ Types of multiplexing ✓ Types of demultiplexing • **Implementation of modulation and demodulation** • **Implementation of multiplexing and demultiplexing**	
Resources required for the indicative content	
Equipment	Computers, Projector, Projection screen, Printers, Oscilloscope, Power supply, Modulation & demodulation trainer kit, Function generator, Multiplexing & demultiplexing trainer kit, Multimeter
Materials	Connecting chords & probes, Chalks, Pens, Books, Papers, Flip-chart, Electronic components, Connecting wires, Breadboard, PCB
Tools	Screwdriver, Voltage Tester
Facilitation techniques & learning activities	• Demonstration and simulation • Individual and group work • Practical exercise • Individualized • Trainer guided • Group discussion
Formative assessment methods	• Written assessment • Oral presentation • Performance assessment • Product based assessment

	• Project-based assessment

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