Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

BACKEND SYSTEM DESIGN

SWDBS401

Design Backend System

Competence

RQF Level: 4

Learning Hours

80 Hours

Credits: 8

Sector: ICT and Multimedia

Trade: Software Development

Module Type: Specific

Curriculum: ICTSWD4002-TVET Certificate IV in Software Development

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<table>
<tr><td>Purpose statement</td><td colspan="5">This specific module describes the Knowledge, skills, Attitude and values required to Design Backend System. Upon completion of this module. The learner will be able to Analyze Backend System Requirements, develop system structure and Build Backend System.</td></tr>
<tr><td>Learning assumed to be in place</td><td colspan="5">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>30%</td></tr>
<tr><td>Individual project /Work</td><td>40%</td></tr>
<tr><td colspan="2"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
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Elements of Competence and Performance Criteria

Elements of competence	Performance criteria
1. Analyze System Backend	1.1 FURPS requirements are effectively gathered based on system application requirements
	1.2 Main objects are properly identified based on the system analysis methodology
	1.3 System interactions are clearly described based on identified objects
	1.4 System Backend Requirements are appropriately reported in line with software requirements document
	2.1 System structure design tools are properly identified based on analysis

2.Develop System Structure	report and design methodology
	2.2 The hardware & software technologies are properly identified based on system requirements
	2.3 The system structure is neatly drawn based on the system requirements and design methodology
3. Build System Design	3.1 The data flow of the system is appropriately developed based on the system design Requirements
	3.2 Physical Data Model is accurately designed based on the analysis report and system structure
	3.3 The documentation of system design is properly based on system analysis and architecture

Intended Knowledge, Skills, and Attitude

Knowledge	Skills	Attitude
✓ Describe backend development Technologies. ✓ Describe System development life cycle (SDLC) ✓ Identify system Analysis tools ✓ Identify FURPS Requirements ✓ Identify main objects of Backend System ✓ Describe system Interaction ✓ Identify system design tools ✓ Identify hardware and software technology	✓ Document report of system requirements ✓ Use System Analysis tools ✓ Use SSADM ✓ Identify of FURPS Requirements ✓ Perform Object-Oriented Analysis and Design ✓ Develop Data Flow diagram ✓ Perform data Modeling ✓ Document system design	✓ Team work ✓ Be critical thinker ✓ Being Innovative ✓ Be attentive. ✓ Being creative ✓ Problem solving ✓ Practical oriented ✓ Detail oriented ✓ User-Centric Approach ✓ Curiosity and Open-Mindedness ✓ Attention to Detail

Course content

Learning outcomes	At the end of the module the learner will be able to:
	1. Analyze System Backend 2.Develop System Structure 3. Build System Design

Learning outcome 1: Analyze System Backend	Learning hours: 17
Indicative content	
• **Gathering FURPS Requirements** ✓ Definition of key terms Backend	

- System
- Server
- Database
- Operating System
- System Development Life Cycle (SDLC)
- API
- JSON
- Framework
- UML
- FURPS (Functionality, Usability, Reliability, Performance and Supportability)

✓System development life cycle (SDLC)

- Phases
- Models (Agile, V shaped, Waterfall, Prototyping, etc.)

✓Backend development Technologies

- Python and its Frameworks
- PHP and its Frameworks
- JAVA and its Frameworks
- JavaScript and its frameworks
- Ruby and its Framework

✓System Analysis tools

- Grid chart
- System Flowchart
- Decision tree
- Simulation
- Decision table

✓ Data Gathering

✓ Identification of FURPS Requirements

- Functionality requirements
- Usability requirements
- Reliability requirements
- Performance requirements
- Supportability

- **Identification of Main objects of Backend System**

✓ Define the Scope of Backend System

✓ Database

✓ APIs

✓ Servers

✓ Frameworks

- **Description of System Interaction**

✓ Purpose of System Interaction

✓Main components of System Interaction

- Web server
- Application Server
- Database Server
- External Services and API
- Message queues or event Streams

- **Report of the System Backend Requirements**

✓Executive summary

✓Detailed analysis of the Current State

✓Findings on Gaps and issues

✓Recommendations

Resources required for the learning outcome	
Equipment	▪ Computer
Materials	▪ Internet
Tools	▪ Microsoft Office ▪ Visual paradigm ▪ E- Draw ▪ Browser
Facilitation	▪ Group discussion

techniques	▪ Brainstorming ▪ Individual Work ▪ Demonstration and simulation
Formative assessment methods /(CAT)	▪ Oral presentation ▪ Written Assessment ▪ Performance Assessment

Learning outcome 2: Develop System Structure	Learning hours: 31

Indicative content

- **Identification of system design tools**
  - ✓ UML (Unified Modeling Language**)**
  - ✓ Algorithm
  - ✓ Flowchart
  - ✓ Data flow Diagram (DFD)
  - ✓ Entity Relation diagram (ERD)
  - ✓ Context diagram
  - ✓ Decision table
  - ✓ Use case diagram
  - ✓ Class Diagram
  - ✓ Decision tree
- **Identification of Hardware and software technology**
  - ✓ Computer Hardware
  - ✓ System software
  - ✓ Application Software
    - Microsoft Office
    - visual paradigm
    - E-Draw max
    - browser

- **Application of SSADM (Structured System Analysis and Design Methods)**
  - ✓ Objective of SSADM
  - ✓ SSADM Techniques
    - Logical Data modeling
    - Data flow Modeling
    - Entity Behavior modeling
  - ✓ Implementation of stages for drawing SSADM
- **Application of Object-Oriented Analysis and Design**
  - ✓ Introduction
  - ✓ Advantage and disadvantages
  - ✓ Phases in Object-Oriented Software development
    - Analysis
    - Design
    - Implementation

Resources required for the indicative content	
Equipment	▪ Computer
Materials	▪ Internet
Tools	▪ Microsoft office ▪ Visual paradigm ▪ Draw ▪ Browser
Facilitation techniques	▪ Group discussion ▪ Brainstorming ▪ Jig Saw

Formative assessment methods /(CAT)	▪ Oral presentation ▪ Written Assessment ▪ Performance Assessment

Learning outcome 3: Build System Design	Learning hours: 32
Indicative content	

- **Development of Data Flow**
  - ✓ Data flow Diagram (DFD)
    - Elements of DFD
    - Rules of Drawing a DFD
    - Level 0 (Context)
    - Level 1
    - Level 2 (Function decomposition)
  - ✓ Software tools
    - Microsoft office
    - visual paradigm
    - E-draw
  - ✓ Develop Data flow diagram of system
- **Application of Physical Data Model**
  - ✓ Identify the database Objects
  - ✓ Design Database
    - Tables
    - Relationships
- **Documentation of system design**
  - ✓ Types of documentation of system design

- System Design document(SDD)
- Functional Specification Document(FSD)
- Technical Specification Document(TSD)
- Database design Document
- Use case Document

✓ System documentation

✓ User documentation

Resources required for the indicative content	
Equipment	▪ Computer
Materials	▪ Internet
Tools	▪ Microsoft office ▪ Visual paradigm ▪ E- Draw max ▪ Browser
Facilitation techniques	▪ Group discussion ▪ Brainstorming ▪ Jig Saw
Formative assessment methods /(CAT)	▪ Oral presentation ▪ Written Assessment ▪ Performance Assessment

Integrated/Summative assessment

Integrated situation

UX Pharmacy is located in Kigali City, Kicukiro District and has two branches one in Remera and another in Kacyiru. The main branch manager purchases medicines and keeps in the pharmacy stock for sell. The Pharmacy supplies medicines to its branches depending on branch sales through stock manager at each branch.

Even though the branches Managers are skilled in using computer, they record and report sales using Microsoft office excel and hard copies. However, this filing system is not reliable as it can cause some problems like loss of data in case documents are misplaced or lost, in addition these paper records occupy large space at the branches and sharing files requires branch managers to travel to the main branch. Moreover, it is very hard to produce daily/weekly/monthly and annual reports about stock and sales status.

As a Backend System designer you are hired to design the system structure and make a documentation that will help the developers to build a backend system for UX Pharmacy.

Instruction:

1. The designed Backend system structure should include

- A visual presentation of data flows within the system.
- A graphical representation of how the system objects are related to each other
- A graphical representation of user and Backend system interaction

2. The designed Backend System structure should have User documentation
3. The designed Backend System structure should have system documentation

Task is needed in 8 Hours

Resources

Tools	▪ Microsoft office E-Draw max
Equipment	▪ Computer

Materials/ Consumables	▪ Papers ▪ Pens ▪ Pencils ▪ Electricity ▪ Rubber

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1: Analyze System Backend (30%)	**1.1** FURPS requirements are effectively gathered based on system application requirements	Ind1. FURPS Requirements are Reported			5
	1.2 Main objects are properly identified based on the system analysis methodology	Ind2. Main objects are selected			4
	1.3 System Backend Requirements are appropriately reported in line with software requirements document	Ind3. System Backend Requirements are Reported			6
Learning outcome 2: Develop System Structure (40%)	2.1.System structure design tools are properly identified based on analysis report and design methodology	Ind1. design tools are used			5
	2.2. The hardware & software technologies are properly identified based on system requirements	Ind1. computer's Hardware are prepared			2
		Ind2. Software Technology is selected			3

	2.3The system structure is neatly drawn based on the system requirements and design methodology	Ind1. SSADM or OOAD is used			10
Learning outcome 3: Build System Design (30%)	3.1. The data flow of the system is appropriately developed based on the system design Requirements	Ind1. DFD software tools are used			2
		Ind2. DFD Rules are applied			2
		Ind2. DFD is developed			2
	3.2 Physical Data Model is accurately designed based on the analysis report and system structure	Ind1. Database Objects are designed			2
		Ind2. ERD is designed			2
	3.3. The documentation of system design is properly based on system analysis and architecture	Ind1. User documentation is reported			2
		Ind2. System documentation is reported			3
Total marks					**50**
Percentage Weightage					**100%**
Minimum Passing line % (Aggregate): 70%					

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