REPUBLIC OF KENYA

COMPETENCY BASED MODULAR CURRICULUM

FOR

AGRICULTURAL ENGINEERING

KNQF LEVEL 6

(CYCLE 3)

PROGRAMME ISCED CODE: 0716 554 A

TVET CDACC
P.O. BOX 15745-00100
NAIROBI

PRINCIPLES OF FLUID MECHANICS

UNIT CODE: 0716 541 17A

TVET CDACC UNIT CODE: ENG/CU/AGR/CC/02/6/MA

UNIT DURATION: 100 Hours

Relationship to Occupational Standards

This unit addresses the unit of competency: **Apply principles of fluid mechanics**

Unit Description

This unit specifies the competencies required by an Agricultural Engineering Technologist Level 6 to apply principles of fluid mechanics. It involves applying principles of flow in fluids, knowledge in viscous flow, operation of fluid pumps, applying hydrostatic forces principles and hydraulic structures principles.

Summary of Learning Outcomes

S/No.	Learning Outcomes	Duration (Hours)
1.	Apply principles of flow in fluids	25
2.	Apply viscous flow principles	25
3.	Apply open channel flow Principles	25
4.	Apply fluid pumps principles	25
TOTAL		**100**

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1 Apply principles of flow in fluids	1.1 Properties of fluids 1.1.1 Density 1.1.2 Viscosity 1.1.3 Temperature 1.1.4 Pressure 1.1.5 Specific volume, weight and gravity 1.1.6 Surface tension	o Practical o Project o Portfolio of evidence o Third party report o Written tests

Learning Outcome	Content	Suggested Assessment Methods

	1.2 Classification of fluids
	
	  1.2.1 Steady and non-steady
	
	  1.2.2 Compressible and incompressible
	
	  1.2.3 Viscous and non-viscous
	
	  1.2.4 Rotational and irrotational
	
	1.3 Types fluid flow
	
	  1.3.1 Steady and unsteady
	
	  1.3.2 Uniform and non-uniform
	
	  1.3.3 Laminar and turbulent
	
	  1.3.4 Compressible and incompressible
	
	  1.3.5 Rotational and irrotational
	
	  1.3.6 One, Two and Three-dimensional flow
	
	  1.3.7 Determination of flow rate in pipes
	
	1.4 Types of pipes used in fluid conveyance
	
	  1.4.1 GI
	
	  1.4.2 HPDE
	
	  1.4.3 PVC
	
	1.5 Types of losses in pipes
	
	  1.5.1 Friction
	
	  1.5.2 Bents and pipe fitting
	
	  1.5.3 Obstruction
	
	  1.5.4 Enlargement
	
	  1.5.5 Reduction in cross-sectional
		o Oral questioning

Learning Outcome	Content	Suggested Assessment Methods
	1.6 Calculations of loses in pipes 1.7 Application of loses in pipes in engineering	

2 Apply viscous flow principles	2.1 Determination of fluid flow velocity
	2.2 Flow equations
	    2.2.1 Bernoulli's equation
	    2.2.2 Flow rate
	    2.2.3 Poiseuille's law
	    2.2.4 Pascal's principle
	2.3 Computations of viscous flow rates
	2.4 Application of viscous flow rates in engineering
		o Practical
		o Project
		o Portfolio of evidence
		o Third party report
		o Written tests
		o Oral questioning

3 Apply open channel flow Principles	3.1 Types of open channel
	    3.1.1 Trapezoidal
	    3.1.2 Triangular
	    3.1.3 Circular
	3.2 Types of flows in open channels
	    3.2.1 Erosive
	    3.2.2 Non-erosive
	    3.2.3 Tranquil
	3.3 Computation of flow in open channels
	3.3.1 Manning's equations
	3.3.2 Chezy equations
	3.4 Computation of erosivity
	3.4.1 Mach number
		• Practical
		• Project
		• Portfolio of evidence
		• Third party report
		• Written tests
		• Oral questioning

Learning Outcome	Content	Suggested Assessment Methods
	3.4.2 Froude number	

4 Apply fluid pumps principles	4.1 Classification of different pumps
	    4.1.1 Reciprocating pumps
	    4.1.2 Centrifugal pump
	    4.1.3 Gear type Pump
	    4.1.4 Diaphragm pumps
	    4.1.5 Submersible pumps
	4.2 Principles of operation of different pumps
	4.3 Pumps performance characteristics
	    4.3.1 Pump efficiency
	    4.3.2 Maximum allowable flow
	    4.3.3 Flow
	    4.3.4 Net positive suction head
	    4.3.5 Discharge
	    4.3.6 Brake horsepower
	    4.3.7 Pressure
	    4.3.8 Mach number
	    4.3.9 Froude number
	4.4 Drawing of performance curve
	4.5 Pump selection for various engineering uses
		• Practical
		• Project
		• Portfolio of evidence
		• Third party report
		• Written tests
		• Oral questioning

Suggested Methods of Delivery

- Demonstration
- Projects
- Group discussion
- Direct instructions

Recommended Resources for 25 Trainees

S/No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Trainee)
A	**Learning Materials**			
1.	Projector		1	1:25
2.	Manuals		1	1:25
B	**Learning Facilities & infrastructure**			
	Classroom	40 M^2	1	1:25
C	**Consumable materials**			
	Stationery	Assorted	1 rim of printing papers 1 packet of pens 1packet of maker pens	1:25
D	**Tools and Equipment**			
1.	marking tools		5 pcs	1:5
2.	Inspection instruments		5 pcs	1:5
3.	Reynolds apparatus		1 pc	1:25
4.	U tube manometer		1 pc	1:25
5.	Bernoulli's theorem apparatus		1 pc	1:25
6.	Venturi meter		1 pc	1:25
7.	Orifice and mouth piece apparatus		1 pc	1:25
8.	Pipe friction apparatus		1 pc	1:25
9.	Pitot tube apparatus		1 pc	1:25