

## SOIL MECHANICS PRINCIPLES

**UNIT CODE:** 0716 541 23A

**TVET CDACC UNIT CODE:** ENG/CU/AGR/CC/06/6/MA

**Duration of Unit:** 100 hours

### Relationship to Occupational Standards

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

### Unit Description

This unit describes the competencies required by an Agricultural Engineering Technologist Level 6 in order to apply soil mechanics principles. It involves conducting site feasibility study, carrying out soil tests and analyzing and interpreting soil test data.

### Summary of Learning Outcomes

| S/No. | Learning Outcomes                    | Duration (Hours) |
|-------|--------------------------------------|------------------|
| 1.    | Conduct site feasibility study       | 10               |
| 2.    | Carry out soil tests                 | 80               |
| 3.    | Analyse and interpret soil test data | 10               |
| TOTAL |                                      | 100              |

### Learning Outcomes, Content and Suggested Assessment Methods

| Learning Outcome                 | Content                                                                                                                                                                                                                                                                                                                                                                           | Suggested Assessment Methods                                                                                                                                                                  |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 Conduct site feasibility study | <p>1.1 Factors to be considered in conducting feasibility survey</p> <p>1.1.1 Site location</p> <p>1.1.2 Clients' requirements</p> <p>1.2 Planning for feasibility survey</p> <p>1.2.1 Tools and equipment for feasibility survey</p> <p>1.2.2 Types of feasibility surveys</p> <p>1.2.3 Procedures for feasibility survey</p> <p>1.3 Preparation of feasibility study report</p> | <ul style="list-style-type: none"><li>• Practical</li><li>• Project</li><li>• Portfolio of evidence</li><li>• Third party report</li><li>• Written tests</li><li>• Oral questioning</li></ul> |

| Learning Outcome       | Content                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Suggested Assessment Methods                                                                                                                                                                         |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2 Carry out soil tests | <p>2.1 Types of soil sampling tools and equipment</p> <p>2.2 Soil sampling methods</p> <p>2.2.1 Random</p> <p>2.2.2 Stratified</p> <p>2.2.3 Systematic</p> <p>2.2.4 Zone</p> <p>2.2.5 W-sampling</p> <p>2.3 Taking a representative sample</p> <p>2.3.1 Accuracy</p> <p>2.3.2 Precision</p> <p>2.3.3 Random error</p> <p>2.4 Soil sampling procedures</p> <p>2.4.1 Field layout</p> <p>2.4.2 Sample collection</p> <p>2.4.3 Compositing</p> <p>2.4.4 Packaging</p> <p>2.4.5 Processing</p> <p>2.4.6 Storage</p> <p>2.5 Soil sample preparation and processing</p> <p>2.5.1 Drying</p> <p>2.5.2 Size reduction</p> <p>2.5.3 Decontamination</p> <p>2.6 Classification of soil test</p> <p>2.6.1 Insitu soil test</p> <p>2.6.2 Laboratory soil test</p> <p>2.7 Soil test parameters</p> <p>2.7.1 Proctor tests</p> <p>2.7.2 Liquid limit</p> | <ul style="list-style-type: none"> <li>○ Practical</li> <li>○ Project</li> <li>○ Portfolio of evidence</li> <li>○ Third party report</li> <li>○ Written tests</li> <li>○ Oral questioning</li> </ul> |

| Learning Outcome                       | Content                                                                                                                                                     | Suggested Assessment Methods                                                                                                                                                                         |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        | 2.7.3 Plastic index<br>2.7.4 Shear strength<br>2.7.5 Aggregate stability<br>2.7.6 Texture<br>2.7.7 Particle density<br>2.8 Soil test procedures and methods |                                                                                                                                                                                                      |
| 3 Analyse and interpret soil test data | 3.1 Soil test data analysis procedure<br>3.2 Interpretation of soil test data<br>3.3 Application of soil test data in engineering tasks                     | <ul style="list-style-type: none"> <li>• Practical</li> <li>• Project</li> <li>• Portfolio of evidence</li> <li>• Third party report</li> <li>• Written tests</li> <li>• Oral questioning</li> </ul> |

#### Suggested Methods of Delivery

- Demonstration
- Projects
- Group discussion
- Direct instructions

#### Recommended Resources for 25 Trainees

| S/No.    | Category/Item                         | Description/ Specifications | Quantity | Recommended Ratio<br>(Item: Trainee) |
|----------|---------------------------------------|-----------------------------|----------|--------------------------------------|
| <b>A</b> | <b>Learning Materials</b>             |                             |          |                                      |
|          | Projector                             |                             | 1        | 1:25                                 |
|          | Soil survey and classification manual |                             | 1        | 1:25                                 |
|          | Scientific calculators                |                             | 25       | 1:25                                 |

|          |                                                 |                   |                                                                         |      |
|----------|-------------------------------------------------|-------------------|-------------------------------------------------------------------------|------|
|          | Computer with internet                          |                   | 1                                                                       | 1:25 |
| <b>B</b> | <b>Learning Facilities &amp; infrastructure</b> |                   |                                                                         |      |
|          | Classroom                                       | 40 M <sup>2</sup> | 1                                                                       | 1:25 |
| <b>C</b> | <b>Consumable materials</b>                     |                   |                                                                         |      |
|          | Stationery                                      | Assorted          | 1 rim of printing papers<br>1 packet of pens<br>1 packet of marker pens | 1:25 |
| <b>D</b> | <b>Tools and Equipment</b>                      |                   |                                                                         |      |
|          | GPS device                                      |                   | 1 pc                                                                    | 1:25 |
|          | Sampling bags                                   |                   | 100pc                                                                   | 1:4  |
|          | Augers                                          |                   | 5 pcs                                                                   | 1:5  |
|          | Composite sample buckets                        |                   | 5 pcs                                                                   | 1:5  |
|          | Slashers                                        |                   | 5 pcs                                                                   | 1:5  |
|          | Pangas                                          |                   | 5 pcs                                                                   | 1:5  |