Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

GIS IN MAPPING

LSVGM402 Apply GIS in Mapping

Competence

RQF Level: 4

Learning Hours 120

Credits: 12

Sector: Construction and Building Services

Trade: Land surveying

Module Type: Specific

Curriculum: CBSLSV4001 – TVET Certificate IV in Land Surveying

Issued date: May, 2023

<table>
<tr><td>Purpose statement</td><td colspan="6">This module describes the knowledge, skills, and attitudes required to describe GIS basic principles, apply GIS tools and plot layout of map. It is designed for students pursuing RQF Level 4 in Land Surveying.</td></tr>
<tr><td>Learning assumed to be in place</td><td colspan="6">use of surveying tools and equipment; surveying computation and adjustment, coordinate measurements, computer literacy, basic surveying project planning.</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 work and presentation</td><td>30%</td></tr>
<tr><td>• Individual work</td><td>40%</td></tr>
<tr><td colspan="3"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
</table>

Elements of Competence and Performance Criteria

Elements of competency	Performance criteria
1. Describe GIS basic principles	1.1. GIS data are appropriately identified according to their classification.
	1.2. GIS components are properly identified according to their types.
	1.3. Data collection methods are properly identified according to the tools and equipment used.
	1.4. Data processing methods are appropriately identified according to data type and their sources.
2. Apply GIS tools	2.1. ArcGIS is correctly installed according to operating systems requirements.
	2.2. ArcGIS interface elements are appropriately identified based on the software standard.
	2.3. ArcGIS components are correctly identified with respect to the software standard.

	2.4. ArcGIS Tools are correctly applied with respect to the software standard and project specifications.
3. Plot layout of map	3.1. Map elements are properly arranged according to the standard of cartographic mapping criteria.
	3.2. Map drawing format is appropriately selected according to the project requirements.
	3.3. Map is correctly plotted according to the project specifications.

Intended Knowledge, Skills and Attitude

Knowledge	Skills	Attitude
✓ Describe GIS basic principles ✓ Identify methods of GIS data collection ✓ Describe methods of data processing ✓ Understand installation process of GIS software ✓ Identify elements of ArcGIS user interface ✓ Identify elements of map ✓ Identify types of plotting format	✓ Apply GIS data collection methods ✓ Apply data processing techniques ✓ Apply GIS Tools form map creation ✓ Plot a layout map ✓ Apply ICT skills ✓ Apply safety precautions at workplace ✓ Apply communication skill at workplace ✓ Apply report writing skills	✓ Demonstrate decision marking attitude during the GIS mapping project planning ✓ Demonstrate flexibility and punctuality during the GIS mapping data collection. ✓ Demonstrate team working spirit in GIS mapping ✓ Demonstrate creativity, innovative idea and analytical thinking throughout map design work

Course content

Learning outcomes	At the end of this module the student will be able to: 1. Describe GIS basic principles 2. Apply GIS Tools 3. Plot layout of map
Learning outcome 1: Describe GIS basic principles	**Learning hours: 25**

Indicative content

- **Identification of GIS Data**
  - ✓ GIS functions and applications
  - ✓ Classification of GIS data
    - Spatial Data
    - Non-spatial data (attribute data)
- **Identification of GIS Components**
  - ✓ GIS Users
  - ✓ GIS Software
  - ✓ GIS Hardware
  - ✓ Data
  - ✓ Procedures
- **Identification of data collection methods**
  - ✓ Photogrammetric methods
  - ✓ Ground survey methods
  - ✓ UAV methods
  - ✓ Remote sensing methods
- **Identification of data processing methods**
  - ✓ Sources of data
    - Primary data

- Secondary data

✓ Data processing methods

- Coordinate computation from primary raw data
- Scanning existing maps
- Digitizing maps and images

Resources required for the learning outcome	
Equipment	Hand held GNSS receiver, Differential GNSS receiver, total station, theodolite, levels, aerial cameras, EDM, tacheometer, computer, laser scanner, PPE, printer, projector.
Materials	Field book, pens, warning tape, beacons, marker, pen, pencil, paint, safety cones, flags, printing paper, first aid kit, chalks.
Tools	Pegs, nails, hammer, panga, plumb bob, tape measures, chains, arrows, prisms, compass, calculator, staff reading, reflector, brush, tripod, communication radios, chalkboard, GIS software, storage devices, orthophotographs, base map, existing digital images.
Facilitation techniques	Demonstration, Practice, Individual and group work, Trainer guided, Group discussion, Brainstorming
Formative assessment methods /(CAT)	Written assessment, Oral assessment, Performance assessment.

Learning outcome 2: Apply GIS tools	**Learning hours: 65**
Indicative content	

- **Installation of ArcGIS Software**
  - ✓ ArcGIS software versions
  - ✓ Computer operating systems
    - 32-bit
    - 64-bit
- **Identification of ArcGIS Interface elements**
  - ✓ The main menu

- ✓ Standard toolbar
- ✓ The subject area (display area)

- **Identifications of ArcGIS Components**
  - ✓ ArcMap
  - ✓ ArcCatalog
  - ✓ Arc Toolbox
- **Application of ArcGIS Tools**
  - ✓ Data entry
  - ✓ Data analysis (raster and vector)
    - Update attribute table
    - Georeferencing
    - Buffer
    - Merge
    - Clip
    - Interpolation
    - Digitising
  - ✓ **Data presentation**
    - Deed plans
    - Maps
    - Reports

Resources required for the learning outcome	
Equipment	Computer, projector, printer.
Materials	Books, pens, pencil, paint, brush, printing paper, orthophotographs, base map, chalks, printer cartridge, notebooks.
Tools	Calculator, chalkboard.
Facilitation techniques	Trainer guided, Demonstration, Practice, Group discussion, Brainstorming, Individual and group work, Research
Formative assessment methods /(CAT)	Written assessment, Oral assessment, Practices

Learning outcome 3: Plot layout of map	Learning hours: 30

Indicative content

- **Arrangement of map elements**
  - ✓ Map Symbolisation
  - ✓ Map Generalisation
  - ✓ Map layout elements
    - The subject area
    - Legend
    - Title
    - North arrow
    - Frame/Border
    - The scale indicator
    - Insets
    - Coordinate system
- **Selection of Map drawing formats**
  - ✓ Factors influencing map format selection
  - ✓ Types of map drawing formats
    - PDF
    - JPEG
    - TIFF
    - DWG
    - MXD
    - DXF
- **Plotting of map**
  - ✓ Procedures of plotting
  - ✓ Procedures for exporting

Resources required for the learning outcome

Equipment	Computer, projector, printer, chalkboard, plotter.

Materials	Books, pens, pencil, printing paper, orthophotographs, base map, chalks, printer cartridge, notebooks.
Tools	Calculator, duster.
Facilitation techniques	Trainer guided, Demonstration, Practice, Group discussion, Brainstorming Individual and group work, Presentations, Research
Formative assessment methods /(CAT)	Written assessment, Oral assessment, Performance assessment, Product based assessment.

Integrated/Summative assessment

Integrated situation

Geo-Consult Ltd, a company that specializes in GIS has been engaged by Rwanda TVET Board (RTB) to produce topographic maps of the Technical Secondary Schools in Rwanda and also to determine the area of each school. As an assistant GIS technician, employed by Geo-Consult Ltd you have been assigned to perform this task and you must produce a map of Nyanza TSS.

Survey data must be collected using DGNSS receiver, at least 50 points must be measured and ArcGIS software should be used to produce the map. The map should show the boundary of school, the roads/streets inside the school, the major buildings and their functionalities. RTB also want to plant trees and flowers on land outside the school boundary, the map must therefore show land within 5 meters from the school boundary. Softcopy pdf file and a printed map on A3 paper size must be submitted. Instruments, tools and materials are provided by the company and the work should be completed in 12 hours.

Resources

Tools	Tape measure, calculator, brush.
Equipment	DGPS, printer, plotter.
Materials/ Consumables	Pegs, notebook, pen/pencil, clipboard, field book, printing paper, paint.

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
1. Describe GIS basic principles (15%)	1.1. Data collection methods are properly identified according to the tools and equipment used.	1. Tools are selected.			1
		2. Materials are selected.			1
		3. Equipment selected and checked			2
		4. PPE used			2
		5. DGPS coordinate system set correctly			2
		6. Accuracy of GPS Checked			2
	1.2. Data processing methods are appropriately identified according to data type and their sources.	1. At least 50 points collected			5
		2. Surveyed data organized correctly			2
		3. Data format is correctly selected			3
2. Apply GIS Tools (60%)	2.1. ArcGIS Tools are correctly applied with respect to the software standard	1. Collected data is transferred to computer correctly			4
		2. Data is imported correctly			4
		3. Data is displayed correctly			5

		4. Folders and geodatabase are created correctly			6
		5. Imported data is converted into shapefiles or feature class correctly.			6
		6. Attribute data is created and updated correctly			10
		7. Editing is well done			15
		8. Buffer of five (5) meters along the school boundary is created correctly			10
3. Plot layout of map (25%)	3.1. Map elements are properly arranged according to the standard of cartographic mapping criteria.	1. Symbols and colours are assigned appropriately			8
		2. Map format (size and shape) is selected correctly			3
		3. Map elements are inserted and arranged correctly			8
	3.2. Map drawing format is appropriately selected according to the project requirements.	1. Pdf file is correctly saved			3

	3.3. Map is correctly plotted according to the project specifications.	1. Map is plotted correctly to scale			3
Total marks					100
Percentage Weightage					100%
Minimum Passing line % (Aggregate): 70%					

References

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