

Surveying Ii Handout Department Of Civil Engineering Aau

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**Surveying Ii Handout Department Of Civil Engineering
Aau :**

Surveying II Handout: Department of Civil Engineering, AAU - A Comprehensive Guide

This guide provides a comprehensive overview of Surveying II, specifically tailored for students in the Department of Civil Engineering at Addis Ababa University (AAU). It covers key concepts, step-by-step procedures, best practices, and common pitfalls to avoid. This guide aims to supplement the official course materials and enhance your understanding.

Keywords: Surveying II, AAU Civil Engineering, Surveying Techniques, Leveling, Theodolite, Total Station, Traversing, Contouring, GPS Surveying, Error Analysis, Surveying

Calculations, Best Practices, Common Pitfalls.

I. Introduction to Surveying II at AAU

Surveying II builds upon the foundational knowledge gained in Surveying I. This course typically delves deeper into advanced surveying techniques, focusing on precision and accuracy. Expect to encounter more sophisticated instruments and complex calculations. Key topics generally include:

Precise Leveling: Techniques for high-accuracy elevation determination.

Traversing: Establishing a network of points with known coordinates.

Triangulation and Trilateration: Determining the position of points using angles and distances.

Contouring: Creating topographic maps representing the land's surface.

Total Station Surveying: Utilizing modern electronic

instruments for efficient data acquisition.

GPS Surveying: Understanding GPS principles and applications in surveying.

Error Analysis and Adjustment: Identifying and mitigating errors in surveying measurements.

II. Precise Leveling: A Step-by-Step Guide

Precise leveling is crucial for establishing accurate elevations. The procedure typically involves:

1. Instrument Setup: Carefully level the leveling instrument over a stable point.
2. Backsight (BS): Take a reading on a benchmark (point with known elevation).
3. Intermediate Sight (IS): Take readings on intermediate points along the level line.
4. Foresight (FS): Take a reading on a turning point (temporary benchmark).
5. Moving the Instrument: Relocate the instrument to a new position, using the foresight point as the new backsight.
6. Repeating Steps: Continue this process until all points are leveled.
7. Calculations: Calculate the elevations of all points using the formula: $\text{Elevation} = \text{Previous Elevation} + \text{BS} - \text{FS}$ (or IS depending on the point).

Example: If a benchmark has an elevation of 100.00m, a BS of 1.50m, and an FS of 2.00m, the elevation of the foresight

point is $100.00 + 1.50 - 2.00 = 99.50\text{m}$.

Best Practices:

Use a stable tripod.

Ensure the instrument is properly leveled.

Take readings carefully and record them accurately.

Avoid extreme temperature fluctuations.

Common Pitfalls:

Incorrect leveling of the instrument.

Incorrect reading of the leveling staff.

Improper recording of data.

Ignoring atmospheric conditions.

III. Theodolite and Total Station Surveying

Theodolites and Total Stations are fundamental instruments in surveying.

A. Theodolite:

Setting up: Level the theodolite carefully over the designated point.

Measuring Horizontal Angles: Read and record the horizontal angle between two points.

Measuring Vertical Angles: Read and record the vertical angle to determine elevation differences.

B. Total Station:

Setting up: Similar to theodolite, but with electronic distance measurement (EDM) capabilities.

Measuring Distances and Angles: The total station automatically measures both horizontal and vertical angles, as well as distances.

Data Recording: Data is electronically stored, simplifying data processing.

IV. Traversing and Coordinate Calculations

Traversing involves establishing a network of points by measuring angles and distances. Calculations involve using trigonometry to determine the coordinates of each point.

Step-by-step:

1. Establish a Base Line: Measure a precise baseline between two known points.
2. Measure Angles and Distances: Measure the horizontal angles and distances between consecutive points.
3. Coordinate Calculation: Use trigonometric formulas (e.g., latitude and departure) to compute the coordinates of each point.
4. Error Adjustment: Adjust for any discrepancies in the traverse using appropriate methods (e.g., Bowditch method).

V. Contouring and Topographic Maps

Contouring involves creating lines of equal elevation (contour lines) on a map. This representation provides a visual depiction of the land's topography. Techniques include interpolation from spot elevations and using specialized software.

VI. GPS Surveying

GPS surveying uses satellite signals to determine the three-dimensional coordinates of points. Understanding different GPS techniques (e.g., static, kinematic) is essential.

VII. Error Analysis and Adjustment

Systematic and random errors are inherent in surveying. Understanding error propagation and employing appropriate adjustment techniques is crucial for ensuring the accuracy of results.

VIII. Summary

Surveying II at AAU demands a thorough understanding of advanced surveying techniques and instrumentation. This guide provides a foundational overview, emphasizing step-by-step procedures, best practices, and common pitfalls to

avoid. Mastering these concepts is vital for successful completion of the course and future professional practice.

IX. FAQs

1. What are the key differences between a theodolite and a total station?

A theodolite measures only angles, while a total station measures both angles and distances electronically. Total stations are significantly more efficient and accurate.

2. How do I deal with systematic errors in leveling?

Systematic errors are often caused by instrument malfunction or improper procedures. Careful instrument calibration, proper leveling, and consistent observation techniques are crucial to minimize them.

3. What are the different types of traverses?

Common traverse types include open traverses (starting and ending at different points) and closed traverses (returning to the starting point). Closed traverses allow for error detection and adjustment.

4. How does GPS technology improve surveying accuracy?

GPS utilizes multiple satellites to precisely determine the

three-dimensional coordinates of a point, overcoming limitations of traditional terrestrial methods, especially in remote areas.

5. What software is commonly used for surveying data processing at AAU?

Specific software used varies depending on the course and instructor. However, common software packages used in civil engineering surveying include AutoCAD Civil 3D, ArcGIS, and specialized surveying software packages. It's recommended to check with your instructor for specific software requirements.

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