Professional Certificate in Geodesy and Surveying in Civil Engineering

# Surveying Fundamentals

Surveying Fundamentals is a key course in the Professional Certificate in Geodesy and Surveying in Civil Engineering. Surveying is the process of measuring and mapping the earth's surface. Surveying is used to establish property boundaries, create topographic maps, determine the location of construction sites, and much more. Here are some key terms and vocabulary related to Surveying Fundamentals:

1. **Survey**: A systematic measurement and mapping of a specific area of the earth's surface. Surveys are used to establish property boundaries, create topographic maps, and determine the location of construction sites.
2. **Topographic Map**: A map that shows the natural and man-made features of a specific area, including elevations. Topographic maps are used for planning and designing land development projects, such as highways, bridges, and buildings.
3. **Horizontal Distance**: The distance between two points on the same horizontal plane. Horizontal distance is measured using a tape measure or electronic distance measuring instrument (EDMI).
4. **Vertical Distance**: The distance between two points on different vertical planes. Vertical distance is measured using a level or total station.
5. **Level**: A surveying instrument used to measure vertical distances. Levels consist of a telescope mounted on a tripod, with a spirit level used to ensure the telescope is level.
6. **Total Station**: A surveying instrument that combines the functions of a theodolite (an instrument used to measure horizontal and vertical angles) and an EDMI (an instrument used to measure horizontal distance).
7. **Angle**: The measurement of the amount of rotation between two intersecting lines. Angles are measured in degrees, minutes, and seconds.
8. **Azimuth**: The horizontal angle between a fixed point (such as true north) and a second point, measured in a clockwise direction from the first point.
9. **Plane Table**: A drafting table used in the field for creating maps and plans. Plane tables are used in conjunction with alidades (a straight edge used for measuring distances and angles) and transits (an instrument used to measure horizontal and vertical angles).
10. **Global Positioning System (GPS)**: A satellite-based navigation system used to determine the precise location of a receiver on the earth's surface. GPS is used for a variety of surveying applications, including establishing property boundaries, creating topographic maps, and determining the location of construction sites.
11. **Geodetic Survey**: A high-precision survey used to establish control points over large areas, such as states or countries. Geodetic surveys are used to create accurate maps and to determine the precise shape and size of the earth.
12. **Triangulation**: A surveying method used to determine the location of a point by measuring the angles between the point and two known points. Triangulation is used to establish property boundaries and to create topographic maps.

13. **Traverse**: A series of connected survey measurements used to determine the location and shape of a specific area. Traverses are used to establish property boundaries, create topographic maps, and determine the location of construction sites.
14. **Taping**: A surveying method used to measure horizontal distances using a tape measure. Taping is used for short distances and for establishing property boundaries.
15. **Electronic Distance Measuring Instrument (EDMI)**: An electronic device used to measure horizontal distances. EDMI's use light or sound waves to determine the distance between two points.
16. **Scale**: The ratio between the distance on a map or plan and the corresponding distance on the ground. Scales are expressed as a representative fraction, such as 1:1000, where 1 unit on the map represents 1000 units on the ground.
17. **Contour Line**: A line on a topographic map that connects points of equal elevation. Contour lines are used to show the shape of the terrain.
18. **Datum**: A reference point or surface used to establish vertical and horizontal control for a survey.
19. **Monument**: A physical marker used to establish a survey control point. Monuments can be made of a variety of materials, including iron rods, concrete markers, and brass disks.
20. **Closed Traverse**: A traverse that starts and ends at the same point, allowing for the calculation of errors and adjustments.
21. **Open Traverse**: A traverse that does not start and end at the same point, requiring the use of exterior observations to calculate errors and adjustments.
22. **Transit**: An instrument used to measure horizontal and vertical angles. Transits consist of a telescope mounted on a tripod, with a spirit level used to ensure the telescope is level.
23. **Alidade**: A straight edge used for measuring distances and angles on a plane table. Alidades can be straight or curved and are used in conjunction with a plane table and a transit.
24. **Grid**: A network of evenly spaced horizontal and vertical lines used to locate points on a map or plan. Grids are used to ensure accuracy and consistency in the location of points.
25. **Rectangular Coordinate System**: A coordinate system used to locate points using horizontal and vertical distances from a known origin. Rectangular coordinate systems are used in conjunction with grids and scales to ensure accuracy and consistency in the location of points.

Here are some examples and practical applications of Surveying Fundamentals:

* A surveyor is hired to establish the property boundaries for a new housing development. The surveyor uses a total station to measure horizontal and vertical distances and angles, and creates a topographic map of the area.
* A civil engineer is designing a new highway and needs to create a detailed topographic map of the area. The engineer uses a GPS receiver to establish control points and create a precise topographic map of the area.
* A construction company is building a new skyscraper and needs to establish the precise location of the building on the construction site. The surveyor uses a level and a tape measure to establish the horizontal and vertical location of the building.
* A land developer is creating a new subdivision and needs to establish the precise location and shape of the subdivision. The surveyor uses triangulation and a plane table to establish the location and shape of the subdivision.

* A geodesist is establishing a new geodetic control network for a state. The geodesist uses precise GPS measurements and a closed traverse to establish the control network.

Here are some challenges related to Surveying Fundamentals:

* Understanding the principles of measurement and mapping used in surveying.
* Learning to use surveying instruments, such as total stations, levels, and GPS receivers.
* Understanding the principles of triangulation, traversing, and mapping used in surveying.
* Applying the principles of surveying to real-world situations, such as establishing property boundaries, creating topographic maps, and determining the location of construction sites.

In conclusion, Surveying Fundamentals is a critical course in the Professional Certificate in Geodesy and Surveying in Civil Engineering. Surveying is used to establish property boundaries, create topographic maps, determine the location of construction sites, and much more. Understanding the key terms and vocabulary related to Surveying Fundamentals is essential for success in the field of surveying. Through a combination of lectures, hands-on training, and real-world applications, students will gain a comprehensive understanding of Surveying Fundamentals and be prepared for a successful career in the field.