

‘Fundamental of surveying’
Lecture-1
Surveying, types of surveying,
shape of the earth

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Outline

- ✓ **Surveying**
- ✓ **Type of measuring distance**
- ✓ **Types of measuring angle**
- ✓ **Units of measurement**
- ✓ **Types of Surveying**
- ✓ **Shape of the earth**

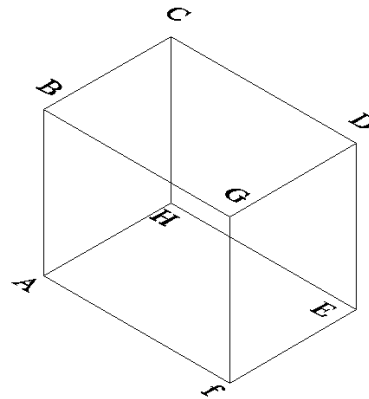
Fundamentals of Surveying “Geomatics”

Surveying: It is the art, science and technology of determination of relative position on or below the earth’s surface or combination of such points.

- ❖ Early Egyptians (3000 B.C.) used ropes for distance measurement having knots tied at convenient points on the rope to aid in the measurement process.
- ❖ In the 1500, Edmund Gunter invented a 66 ft chain, comprising 100 links [1 chain = 100 links = 66 feet].

Types of measurement:

1. Horizontal Planes
(AHEF), (BGDC)
2. Vertical Planes
(AHCB), (FEDG)



Angle:

1. Horizontal Angle: HAE
2. Vertical Angle: Zenith Angle (BAC)
Altitude Angle (HAC)

Units of Measurement

English System

Foot (ft)

1 ft = 12 inch

1 yard = 3 ft

1 mile = 5280 ft

International System

meter (m)

1 m = 100 cm

1 cm = 10 mm

1 km = 1000 m

1 inch = 2.54 cm

1 m = 39.39 inch

100 ft = 30.48 m

Angles: to measure angles, we have many systems;

1-Sexagecimal system

Degree, Minute, Second

2-Centesimal system

Grad, Centigrad, Centi-centigrad

2-Radian method

600 mil

6400 mil

General Types of Surveying

1. **Plane Surveying:** it is a type of surveying which considers the earth's surface in flat.
2. **Geodetic Surveying:** it's a type of survey which considers the curvature of earth's surface.

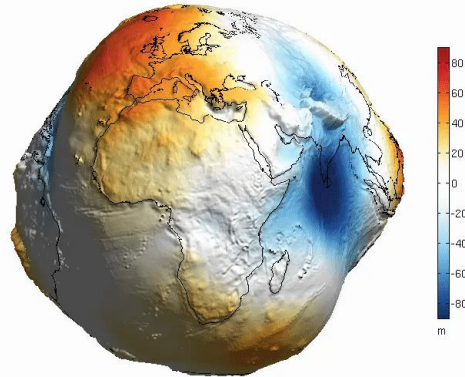
Types of Surveying:

1. **Control Surveying:** it is the surveying deals with the establishment of horizontal and vertical control points in the area. (e.g. country) (national control points).

2. **Topographic Surveying:** it is the surveying for representation of the features of natural, man-made and topography of the area on a map.
3. **Cadastral Surveying:** it is the surveying of the defining the boundary of private property.
4. **Hydrographic Surveying:** it is the survey of the depth of water bodies and topography of the seabed.
5. **Route Surveying:** it is the survey of establishment of routes of roads, railway, pipeline, electricity line, etc....
6. **Mine Surveying:** it is the survey made on or beneath the earth's surface for mining operations.

Shape of earth

The shape of earth is a complicated irregular surface; therefore it's not possible to be represented mathematically.



Geoid height (EGM2008, nmax=500)

- ❖ Since water is covering 70% of the earth's surface, it will be the best representation of earth's surface. This surface is called Geoid.
- ❖ The geoid is not a regular surface. Under gravity forces its shape is changing from a place to another. Also it's not possible to be represented mathematically.
- ❖ Scientists thought about a surface as close as possible to the geoid that can be represented mathematically, this was an ellipse.

A: semi-major axis (equator radius)

B: semi-minor axis (polar radius)

If the ellipse is rotated around minor axis it will form (a), surface called (ellipsoid) which will be the nearest shape to the geoid.

- Maximum difference between ellipsoid and geoid is ± 100 m.
- Difference between (a) and (b) of the ellipse is approximately 21 km.

Scientists tried to obtain values for (a) and (b), they have obtained different values. (There are different ellipsoids)

Name of ellipsoid	$a_{(m)}$	$b_{(m)}$
Airy 1830	6377563	6356257
Clark 1866	6378274	6356651
WGS 84	6378137	6356752

Each country must choose an ellipsoid for map making on basis that the variation between the ellipsoid and the geoid will be minimum.

