Welcome students. In this unit.

We're going to cover up the

module Earth's gravity.

The acceleration due to gravity.

The change with latitude and altitude.

Also. The variation with

respect to mass and density.

We will be covering up gravitation

Earth gravity variations on Earth,

and gravity anomalies.

So a learning outcome of this will be.

You will be learning Earth's gravity,

the factors affecting its variations.

And its applications.

Gravitation. Gravitation is a

natural phenomenon by which

the objects attract each other.

It is the force which is

responsible for keeping Earth,

moon and other planets in

their respective orbits.

It is the same force which is

responsible for the formation of tides,

which we see in the oceans.

And it is the reason for existence of Earth,

sun and other macroscopic

objects in the universe.

Because all these bodies formed.

Out of gravitational forces.

The strength of attraction here

depends on mass of the two bodies

and the distance between them.

Let us have a look at Isaac Newton's theory.

He formulated the theory

of universal gravitation,

which states the following.

Every single point.

Most attracts every other point by a force

pointing along the line combining the two.

The force is proportional to the product

of two masses and inversely proportional

to the square of the distance between

the point masses and it is given by.

F is equal to G.

The product of M1M2.

By our square.

Here. M1 and M2 are the two masses

which are separated by a distance R.

F in the formula which we had mentioned

is the magnitude of gravitational

force between the two point masses.

G is the gravitational constant.

M1 is the mass of first point mass

and M2 is the second point mass.

And as I mentioned, it is the

distance between the two point masses.

Now let us see Earth's gravity.

The gravitational field is

numerically equal to the acceleration

of objects under's influence.

The value of this is given by

small letter G and is approximately

equal to 9.8 meters per second.

The precise strength depends.

On location. As it is not

constant throughout the Earth.

The nominal average.

Value is known as standard

gravity and is given by.

Definition 9.8 0665.

The figure varies from place to place.

And there are some factors which

cause the change in variation.

Now we will see what are these factors.

The strength of Earth's gravity varies.

With these four factors, that is.

Latitude. Or altitude.

Local topography.

And geology that is density.

Variation with latitude.

This variation is strongly dependent on.

Two factors that is rotation

or spin of the Earth.

And the earth's. Equitorial bulge

now let us look at the first factor

that is variation with latitude.

So as we observe over here.

The Earth is rotating.

In an anticlockwise manner.

The value of gravity.

Will be much lesser at the

equator as compared to the. Pools

that is because of the spin.

The centrifugal force is much greater

at the equator as compared to the poles.

So that is why the first reason

for variation. At the same time,

when we look at the shape of the earth,

it is not a perfect sphere.

It is rather more bulging

towards the equator.

And slightly flatten. At the poles.

So. The objects which are at the

equator are much more further.

From the center of the Earth at the

equator as compared to that at the poles.

And that is why the variation with latitude.

Variation with altitude.

As an object or a person

goes higher and higher.

The gravity value decreases.

Because the greater the altitude means

greater distance from the Earth center.

So that is about altitude.

Variations with local topography.

Now, as we know the earth surface

is not uniform throughout.

There are certain regions which

are higher as compared to the

others and that is why these local

bodies like mountains or Hills.

They are going to cause

their local attraction.

So these in turn cause fluctuation in

the gravitational field and therefore

these fluctuations are called
gravitational anomalies.

Variations with geology.

The geology is supposed to

play a very important role.

As we know, different rocks have

different densities and gravity

itself is a density concept.

So the presence of dense rocks

in the locality would result

in higher gravity readings.

On a device called as a gravimeter,

which we used to measure it, and these.

Would result into something

called as a positive anomaly.

At the same time,

there are sedimentary rocks.

Ann salt diapirs or solve domes?

Which are very useful in the

exploration of oil fields.

So these lesser values give rise

to a negative anomaly when reading

is taken on a gravimeter.

Applications.

The study of anomalies forms the

basis of gravitational geophysics.

These are measured with

highly sensitive gravimeters.

An all this data is then processed

to find oil and mineral deposits.

To summarize what we have learned.

In this module we learn about gravity,

all the different factors which affect

gravity like latitude, altitude, topography.

And. Finally, mass an.

The applications.

Here are some references.

Thank you.