Hello everyone I am Arati Panshekar assistant

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Today I'm going to deal with the topic

electromagnetic radiation from the Unit

1 introduction and concept model number 3.

The outline of this module is introduction

to EMR , properties of EMR ,regions of EMR,

atmospheric window ,conclusion and references.

After completing this module,

students will be able to understand

the basic concept of EMR.

Students will get familiar with the

relationship between wavelength,

frequency and energy.

Students will comprehend the properties

of EMR and students will perceive

basic knowledge of atmospheric window.

EMR is electromagnetic radiation.

Electromagnetic radiation refers to the

energy that moves with the velocity of

light in a harmonic wave pattern and

consist of electric and magnetic field.

This is the definition given by

Noam Levin in 1999.

EMR consist of two fields,

electric and magnetic.

These two fields are perpendicular to each

other and they travel at the speed of light.

EMR is very important in remote sensing.

The sensor attached to satellites

detect and measure the reflected or

emitted EMR in different portion of

spectrum in the form of images which

are used for obtaining information.

Sun is the important natural source of EMR.

Let us discuss about the properties of EMR.

This is the diagram which shows the

pattern and structure of waves which are

there in the electromagnetic radiation.

These waves have two important components.

These are Crest and trough.

Crest is the highest portion of the wave.

and trough is the lowest part of the wave.

Crest is the highest part of the wave,

and Trust is the lowest part of the.

Wave.

EMR has three properties,

wavelength, frequency and amplitude.

EMR has three properties, wavelength,

frequency and amplitude.

Wavelength refers to the distance

between two successive Crest or trough.

It is represented by a Greek

letter called Lambda.

It can be measured in meter,

centimeter micrometer or nanometer.

Frequency refers to the number of crests

passing a fixed point in one second.

It is measured in Hertz.

Amplitude refers to the height

of Crest from the midpoint.

Next is electromagnetic spectrum.

The order of EMR on the basis of

frequency and wavelength from gamma

Rays to radio waves is called as EMS.

That is electromagnetic spectrum.

This is the diagram which shows the

several bands which are present in the

electromagnetic spectrum in the spectrum.

We have the bands of gamma Rays X Rays.

UV Rays, visible Rays, infrared,

microwaves, and radiowaves.

The gamma Rays have shorter wavelength,

an higher frequency.

As we move towards the right hand side,

you can see the wavelength is increasing

and as we move towards the left hand

side the frequency is increasing.

Although there are several bands in

EMR but we are using only few bands in

remote sensing the bands which are used

in the remote sensing are visible Band,

Infrared Band an microwave.

We are not using ultraviolet

region in remote sensing,

but it is important for us to understand

the properties of ultraviolet region.

This is the region which is

located before visible band and

it is not visible to human eyes.

It is classified into 3 bands visa.

The first one is UV- C which has the

wavelength from 100 to 280 nanometer

which are called as dangerous Rays.

Second one is UV B which

has wavelength from 280 to 315 nanometer and these

are called as burning rays.

the third one is UV- A,

which has wavelength from 315 to 400

nanometer and these are the tanning rays.

We do not have any satellite

which captures data in this band.

It is basically because of

absence of atmospheric window and all

energy is absorbed by the atmosphere

In this band. The next band is visible band.

This is the part of EMR.

Which human eye can detect. its wavelength

varies from 0. 4 to 0.7 micrometer.

Most of the satellites covers visible part of the spectrum because of the

availability of large atmospheric window.

Visible region has three primary colors,

blue, green and red.

These colors are called as primary

color because no single primary color

can be created from any two colors.

This is the chart which shows

the visible bands.

There are seven bands in the visible region.

We have Violet color indigo color,

blue, green, yellow, orange and red.

As we move from Violet to red,

the wavelength is increasing.

and frequency is decreasing.

The next band is infrared region.

This region comes after the visible band.

This band has five sub categories.

These are near infrared with

wavelength from 0.7 to 1.7

micrometer. shortwave

infrared with the wavelength

1.5 to 3 micrometer , midwave,

infrared from 3 to 8 micrometer of

wavelength then long wave infrared which

is also called as thermal infrared.

It has wavelength from 8 to 15 micrometer.

We also have far infrared which has

the wavelength beyond 15 micrometer.

Although we have several bands in

infrared region but we are using

only thermal infrared in remote sensing.

It is basically used to detect the

forest fires and it is also used to

measure land and sea surface temperature.

The next region is microwave region.

This is the region having the

wavelength from 1 millimeter to 1 meter.

The frequency here is 300 giga Hertz,

two 300 megahertz.

It allows observation in all weather

conditions without any restrictions

by clouds or rain.

It can penetrate through cloud,

fog, dust, haze,

as longer wavelengths are susceptible

to atmospheric scattering.

So here in this band we get.

The clear and accurate images.

The next band is Radio Wave region.

Here this band is used for communication

technologies like television,

mobile phones and radios.

Now these are the sub bands

of microwave region.

We have Ka band, k band,

Ku band X band C band s Band

L Band and P band.

These are the frequencies and

wavelength of these bands.

The next term,

which is very important in remote sensing

that is atmospheric window . atmospheric

window is very important for remote sensing.

This is the section of electromagnetic

spectrum where the absorption

is very less by the atmosphere.

It is useful for remote sensing due to

minimum absorption by water, vapors,

carbon dioxide, ozone and oxygen.

The atmospheric window in the EMR is

available in the wavelength of 2 to 2.5

3.2 to 4.2, 4.5 to 5.2, 8 to 9, 10 to 13 micrometer

Now this is the diagram which

shows part of atmosphere where windows are available.

If you see this is the X Rays.

Where the remote sensing is not

at all possible because this is

completely opaque section of EMR.

Here we have ozone and oxygen

which absorbs most of their energy.

Then again the next band we have

that is visible band.

Here the remote sensing is possible

and because here we have

the window visible window which

is used for remote sensing.

Again we have three atmospheric

windows in infrared section and

Where the atmospheric absorption

is very less again from this here

in between infrared and microwave

we have water vapors and carbon

dioxide that absorbs lot of energy

where there is no scope for remote

sensing in microwave we have three

windows available for remote sensing

to capture the data and the radio

window is completely transparent

to the energy which is

Reflected or emitted from

the objects on the earth surface.

Now conclusion of this module is

EMR refers to energy that moves

with the velocity of light in a

harmonic view pattern and consists

of electric and magnetic field.

Part of EMR is used in remote sensing.

The foundation of Remote Sensing

Technology is based on the measurement

and interpretation of patterns of EMR.

The whole range of EMR is called as spectrum.

It is characterized by wavelength

and frequency,

different wavelength and

frequency indicates different potion of EMR.

Certain portion of this EMR is used

in remote sensing where there is

availability of atmospheric window.

These are some of the references

for electromagnetic radiation,

so this was a brief description of

electromagnetic. Radiation, thank you.