**Digital Land Surveying and Mapping (DLS&M)**
Dr. Jayanta Kumar Ghosh
Department of Civil Engineering
Indian Institute of Technology, Roorkee

Lecture – 06
GPS User Segment

Welcome students to lecture number 6, in this lecture I am going to talk on GPS user segment, already we have discussed about the GPS system in which we have found that there is a segment called user segment and that user segment consist of a GPS receiver and it is software, but we need to know more about this user segment because this is the most important part for user to use GPS system and now in the last class, I am already discuss that GPS receiver receives GPS signal from GPS satellites and the signal contains a (Refer Time: 01:12) of information in terms of code career and data and different types of code career and data is also available. Now we need to know more about GPS user segment to understand that we did not make use of all the parts of the GPS signal only a small part of the GPS signal may be used for particular use now to make use of that we need to know how above the GPS user segment more.

(Refer Slide Time: 01:59)
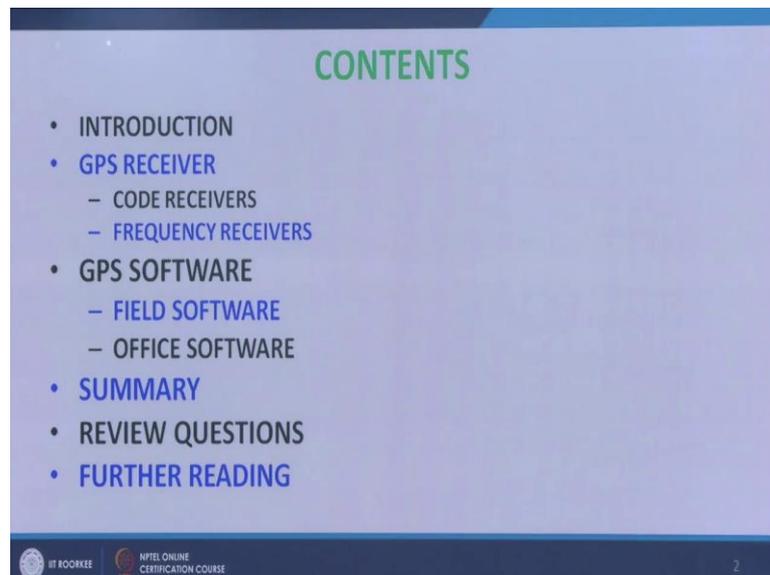
So, we need to know more detail about the GPS receiver and then GPS software which are the 2 components of GPS user segment.

So already I told you that using GPS receiver we do receive the GPS signal from GPS satellite vehicles and GPS satellite vehicle broadcast GPS signal which are in L band; L band GPS signal and these signal we as a user this is the GPS receiver and with this software are available

(Refer Slide Time: 02:20).
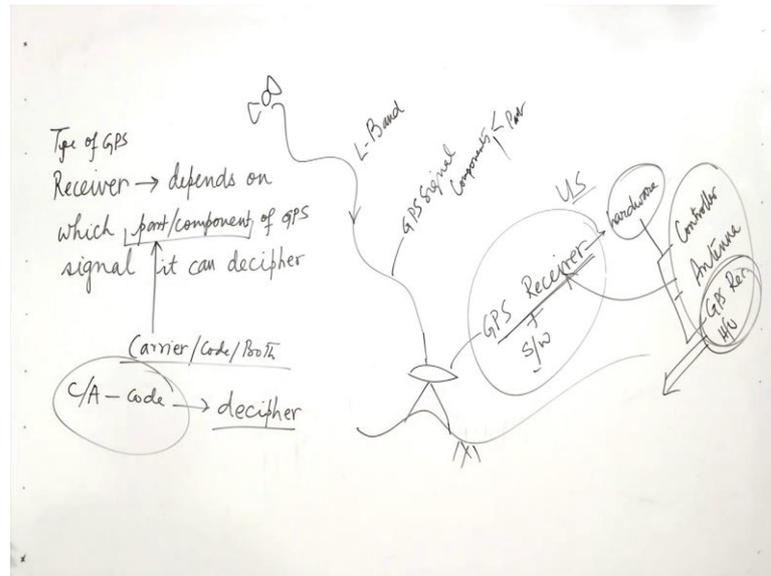
So, this is our user segment. So, GPS receiver hardware this is a hardware or electronic instrument make use of some software to receive this GPS signal and these signal these GPS signal actually has many components and part of these components we will be making use for a long use now we need to know how to make use of these components by using different types of receiver or different types of software and that is what we I am going to tell in this class. So, in the in some other class I have already told that GPS receiver is nothing, but the hardware electronic hardware actually it will consists of 2 part 3 parts already I told you that one is called controller and then antenna and actual GPS hardware GPS receiver hardware. So, these are the 3 parts which constitutes the GPS receiver.
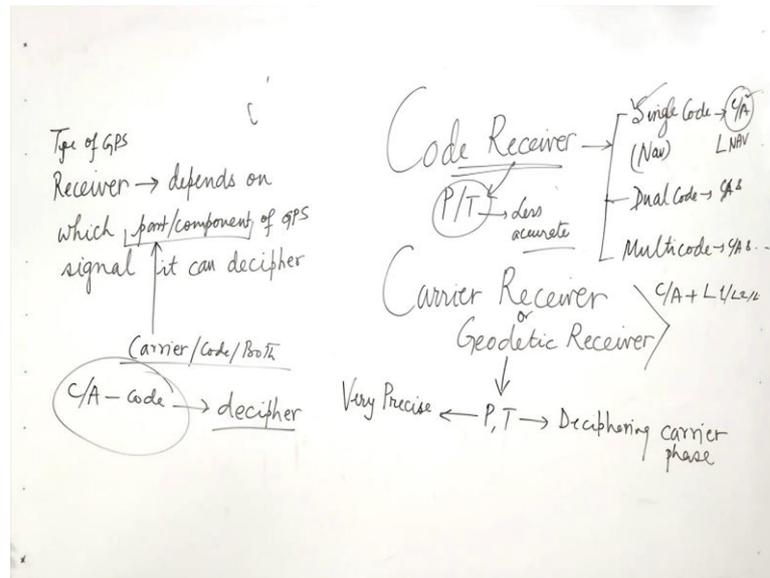
(Refer Slide Time: 04:30)
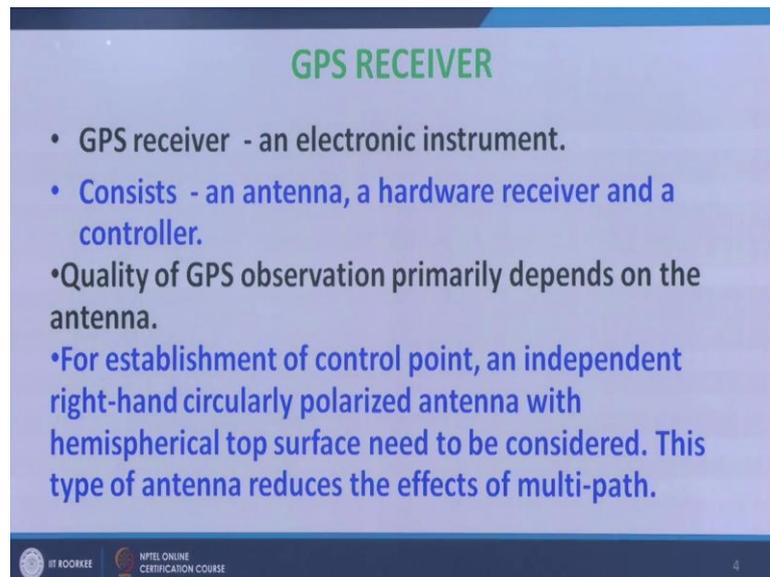
Now these receiver hardware depending upon which part of the signal these GPS receive the hardware can decipher on the basis of that the type of GPS receiver depends. So, the GPS receiver type of GPS receiver type of GPS receiver depends on which part or component of GPS signal, it can decipher now which part or component by this I wanted to tell you the part of carrier or code or both because as I told you in the last class that the data that is available in GPS signal is the most important part and that we need to know we have to decipher, but to get that data we need to for decipher either code or carrier and code both now one more thing has to be emphasize that whatever is the type of GPS receiver it will always decipher the CA code; that means, this is the minimum which GPS receiver should be able to decipher now depending on what are a receiver we will be able to decipher the code or code and carrier both it will it is specified into 2 types; one is called code receiver.

This type of receivers can decipher only the code part of the GPS signal and the other part is carrier receiver also called geodetic receiver which deciphers the CA code plus any other frequency L 1 or L 2 or L 2 L 3 and whatever it is.

Now depending upon how many; what are the codes it can decipher it may be single code now for single code receiver, it is the CA code that it has to decipher; as I told you all GPS receiver must be able to decipher the CA code. So, single code GPS receiver means it will decipher the CA code; that means, and from in the CA code, it will have the N lab data. So, we will get the data of N lab format from code receiver and the time from CA code, it may be dual code. So, dual code, so in case of dual code, at least it is CA and it may any other may be CM, CN or (Refer Time: 08:23).

So, and there may be multi code CA and so, depending upon which part of the how many codes or which codes it will be able to decipher other then CA code it will be dual code and multi code the code receiver provides less accurate positioning as our timing is not that much accurate. So, position and time which the code receiver provides or less accurate and these type of receivers are used for if it is a single code for navigational purpose and for dual code it is the mapping purpose and like that, but the position and time that will get from code receivers are of less accurate other then the code receiver another type of receiver that is available is the carrier receiver or geodetic receiver which provides us the position and time by deciphering the carrier phase carrier phase.

As a result we for both very precise very precise position and time we can get from carrier receiver or geodetic receiver now depending upon how many carrier frequencies it can decipher it may be single frequency or dual frequency or triple frequency. So, we can see where L 1. So, L 1 contains CA code L 2 C and L 1 and L 2 C; L 1 and L 2 C and L 5. So, depending upon which carrier frequency of what are the carrier frequency it can decipher on the basis of that we can say single frequency dual frequency and triple frequency now as I told you that L 1 frequency is good for positioning, but if we have L 1 and L 2 C both; that means, dual frequency it will be not only keep the good position also is these type of receiver will be useful to work under (Refer Time: 11: 37) and many other errors can be minimized by using dual frequency and triple frequency will be still lowest and we can make use of triple frequency for very precise like the deformation (Refer Time: 11:58) like that very precise work. So, depending upon the capability of deciphering the part of the signal we will be able to say which receiver has what type of capability and depending upon that we can go for decision which type of receiver we should use for particular purpose.

Now this GPS receiver actually makes use of different types of software to arrive at other applications or use. So, we need to know more about the GPS software and different types of software how they work what they work. So, now I will be discussing on GPS software.
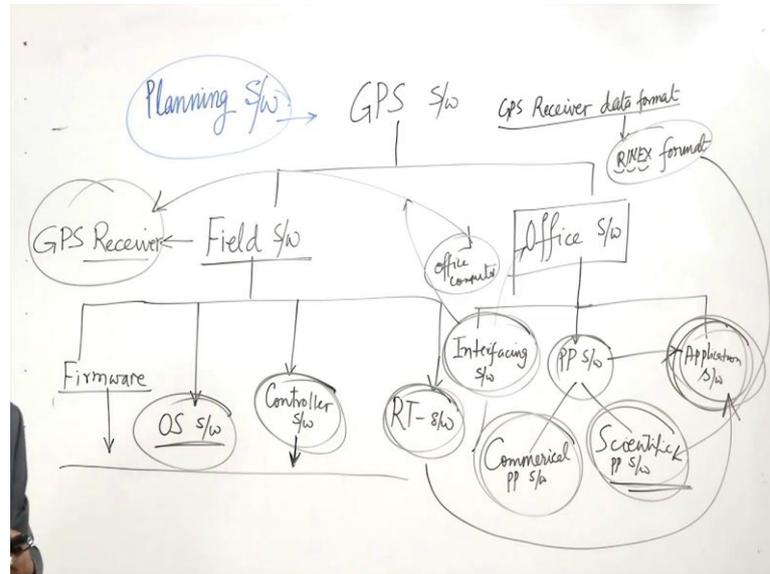
(Refer Slide Time: 13:06)

Now, GPS software are use to operate the GPS receiver to collect data using GPS receiver and to process GPS observations.

(Refer Slide Time: 13:21)

Now, there are 2 permanently types of GPS software one is called field software for the mean it is an we can understand that the software which are be in used in the field along with the GPS receiver those are field software and the softwares which are be used in office for further work with the GPS data then it is called office software. Now again there are different types of field softwares are there and the software which is used to operate the hardware part of the GPS receiver is called firmware then we are the actually GPS receiver is also connected to some (Refer Time: 14:43) computer.

So, to operate the (Refer Time: 14:45) computer we need the operating system software then you will have the controller software as GPS receiver also contains a controller to control the different functions. So, you need to have a controller software and the GPS receiver also contains the real time software which will provide the real time position or which we process the data in real time to though deferent applications now as I told you firm firmwares are the software which basically use to operates and control the receiver hardware.

(Refer Slide Time: 15:41)

And most of the works that the firmware done are on default set up then this firmware works within a operating system software and this operating system software operates and controls the field computer that is attached with the controller system and generally window mobile operating systems are being widely used for GPS controller computer necessary with GPS controller.

Then one domain specific software which is called controller software is available within the controller, this software operates and controls the hardware receiver and by using the controller software we really go for many field works of GPS receiver during data collection and many other works.

So, the fundamental different between the controller software actually operating system software it is a general it works in general like filed opening find closing or like that giving the name of the files like that what we generally do within different our e software, but controller software actually will be used for some particular function associated with the GPS data collection like if we want to know when to give the cup of angle or we want to give the height of the instruments like that it is the domain specific information or controller software works for domain specific works during in the GPS the field in a collection and once the data is being received by the GPS receiver that data will be processed in real time by the real time software that will be available inside the GPS receiver hardware.
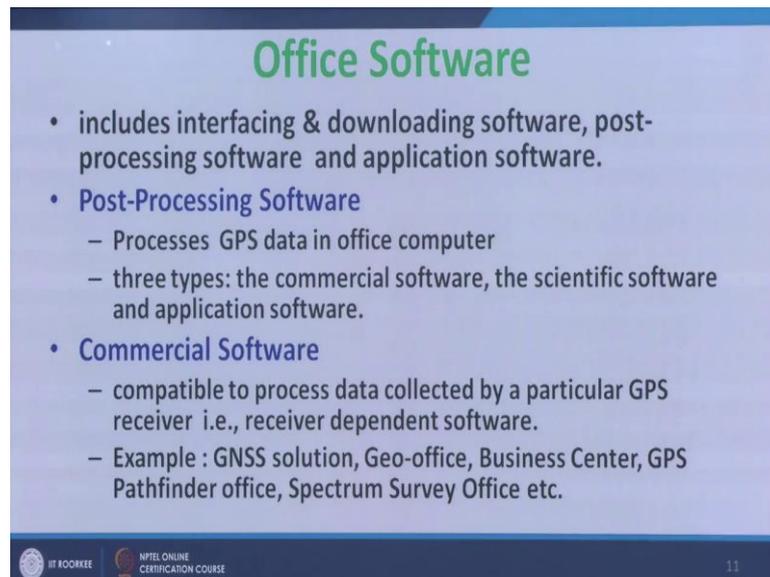
So GPS with this field software's are basically with is available within the GPS receiver now whose data has been collected the data generally gets transfer to office software. So, there will be some input output module between these or and then the data will be process during the office software, now office software also we are of 3 types one is called post processing software before that inter processing software as I told you input output interfacing software then post processing software and then application software now these interfacing software actually it make use it provides the interface between the GPS receiver hardware and office computer office computer. So, the interface between the GPS receiver and the office computer that will be provided by the interfacing

software and thus interfacing software is used to import export the data from the GPS receiver to import to the office software.

Once the data is available in the office computer, but post processing software available within the office computer we will process it, now there are basically 2 types of post processing software one is commercial post processing software and other one is the scientific post processing software, now these commercial post processing software actually these type of software process the data of particular receiver, it is the receiver dependent and the scientific software post processing software are the software which are receiver independent now as we know that for any GPS observation we have to make use of receiver and receiver we will make use of its own particular format to store the data and through use that data we have to make use of the particular commercial processing software that the particular format of the receiver demands or we should convert the GPS receiver data format to rinex format, now what is rinex format it is the receiver independent exchange format. So, any data means I may have 2-3 types of GPS receiver with which I have collected the data all those data I can convert to one can convert to rinex format.

So all data when it would be rinex format then we can import that data to scientific post processing software. So, that is the idea scientific post processing software it can passes data from different types of GPS receiver moreover scientific software's are very precise it provides very accurate information and it will also very difficult to do and fortunately many of the scientific softwares are free of cost still now. So, scientific software generally use for other scientific work or very precise work now here you can see post processing software process the data in office computer 3 types of commercial software scientific software and one more.
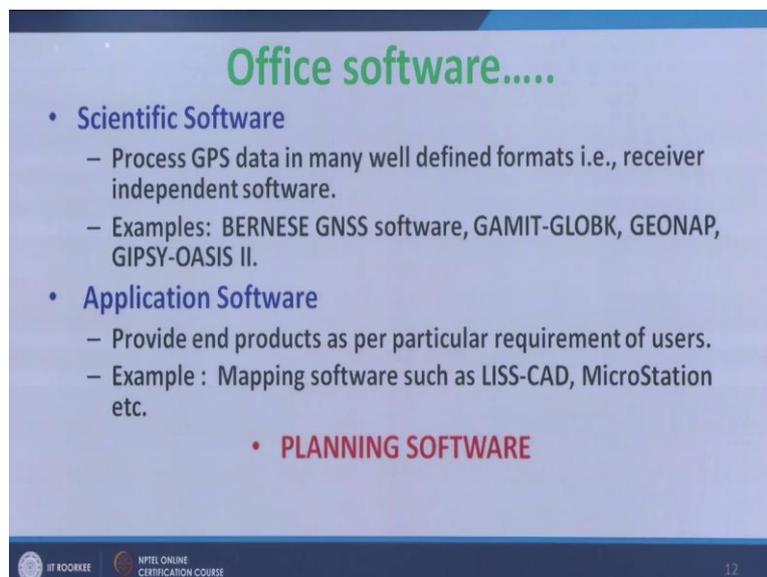
(Refer Slide Time: 23:41)

So, I have given application software another type which is also post processing type now commercial software compactable to process data collected by particular GPS receiver as I told you that it is a receiver dependent software like GNSS solution geo office like that.

(Refer Slide Time: 24:12)

Scientific software process GPS data in many well defined formats receiver independent software and the idea behind is that all the data has to be convert to some standard format called rinex format and that rinex format data will be important to scientific post

processing software and we will process the data in scientific software. Another type of software which is prevalent particular to some particular application in give a particular (Refer Time: 24:45) that is going particular software sorry application software.

So this type of software what it will do it will import the data from our GPS receiver and it will process the data to some particular application like if we want to navigate in a very dense city for navigation purpose. So, what the receiver will do it you will capture the data from the satellite and then it will super import the data on the different routes available in the city and it will guide us to go to particular location along certain road.

So, those all this will be on one real time basis and in doing that work that some particular application software the receiver will use whenever many of these software there is another software which is particularly important for GPS work that is called planning software we will study more about this in future now what is planning software in the last class in some other class I had told you that about the planning operation to be done for any GPS work for. So, during the planning operation or planning work when we have to make use of some particular GPS software which provides us the deferent information about the availability of the GPS satellites they are geometry and many other information. So, that software is called planning software. So, that is another type of software which we generally use for GPS surveying with these I want to conclude today's main content of the class.

Now let me summarize what we are discussed in this class GPS user segment consist of 2 broad part one is the GPS receiver another is the GPS software making use of GPS hardware we collect GPS signal with in which means and these GPS signals we did not to make use whole of the GPS signal only a part of the GPS signal we make use for our particular purpose depending upon which part of the GPS signal the particular GPS receiver can decipher the quality of the receiver or the type of receiver depends. So, on the basis of that there are basically 2 types.

One is that code receiver which receiver the code part of the GPS signals another is the geodetic receiver or carrier frequency receiver which deciphers the carrier frequency along with the CA code. And the frequency receivers are more much more precise in positioning as well as providing time then the code receivers and these receivers are operate through this is operated through some softwares are 2 basic (Refer Time: 28:56)

types one is called field software another is called office software field software's are the software's which are used by the GPS receiver while it will be used to work in the field and office software's are used for processing the field data collected using the GPS receiver. Now office receiver office software is also of 3 types one is called interfacing software which provides us the input output work the post processing software which may be of commercial or scientific software and the application software. So, with these I like to conclude.

Thank you.