Digital Land Surveying & Mapping
Dr. Jayanta Kumar Ghosh
Department of Civil Engineering
Indian Institute of Technology, Roorkee

Lecture - 40
Digital Land Surveying and Mapping

Welcome students, today is a conclusion class for digital land surveying and mapping. In this class I am going to summarize about the different lessons that has been thought in this course and how they are relevant to our digital land surveying and mapping that I am going to summarize. Seven topics broadly I had discussed that is fundamentals of digital land surveying.

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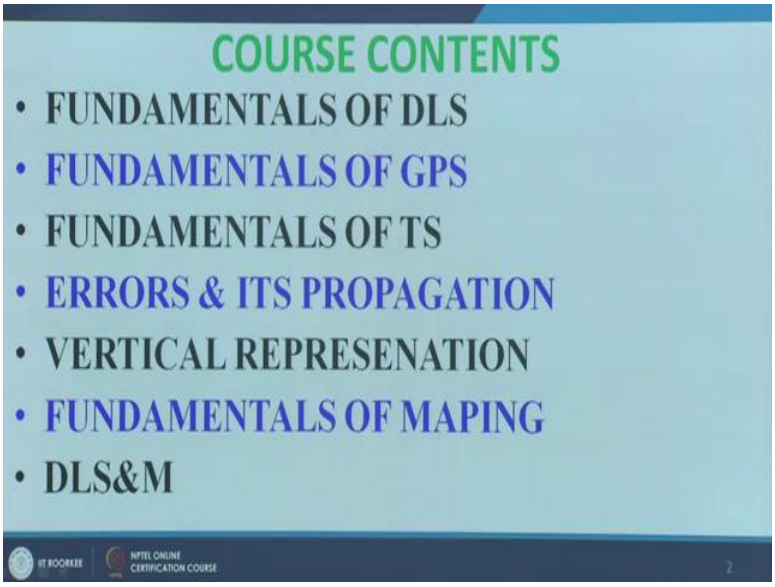

Then fundamentals of GPS, fundamentals of total station then errors and it is propagation vertical representation fundamentals of mapping, and followed by the demonstration of digital land surveying and mapping.

Now, who I had done for fundamentals of DLS; that means, digital land surveying and mapping, and what are the contents and how it is relevant that I will be talking now.

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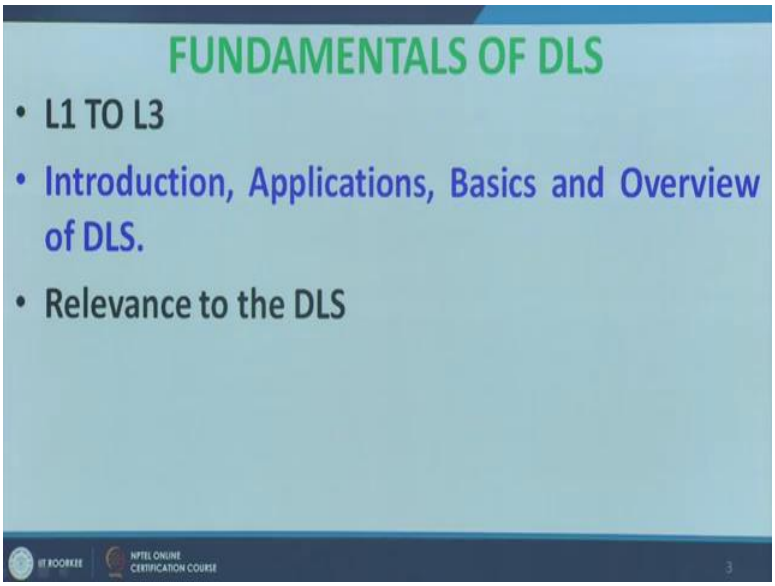

So, the first three lectures I have discussed about the lands digital land surveying, it is applications then the basics and the overview of digital land surveying. As you know I had explain that the surveying is the fundamental for any engineering work. So, engineering survey is the prerequisites for any engineering planning, engineering project planning and design and then to be constructed in the field. Even when we do that we need to have a map specifically a topographic map of the area, which provides us the information about the different objects present on the surface of the earth or surface of the project area as well as how the relief of the terrine varies.

So, these are the information which we do collect through surveying or engineering surveying, and this is carried out by making use of the basic principle of surveying that is from working from whole two part, and to carry out the work we need to go for main different stages of operations; how to carry out this works actually we do fundamentally make some measurement which is known as surveying.

So, to carry out the survey actually we make use of many instruments. Now over the period of time these instruments are improving day by day, and the state of art of the surveying is to make use of some instruments which are precise as well as those provides the digital data. So, that is the basics behind our whole of this course how to collect or what are instruments to be used for collection of lands data and to prepare digital map. Now in the overview I had discussed that the digital land surveying or any land

surveying consist of primarily two parts; one is to establish the control point and then to find out the detailed objects or a location of detail objects and their nature.

So, in this course we have discuss that the control points for digital land surveying is being collected can be collected nowadays by making use of a latest equipment known as GPS global positioning system based digital data collection. And the details of the terrine should be collected by making use of a instrument call total station; measurements from both these instruments we can get in digital format. So, we have taken up these two in our subsequent modules of classes.

So, in the next few classes from lecture 4 to lecture 16, I have discussed about the various names or points that is related to global positioning system that is relevant to our establishment of control point using GPS.

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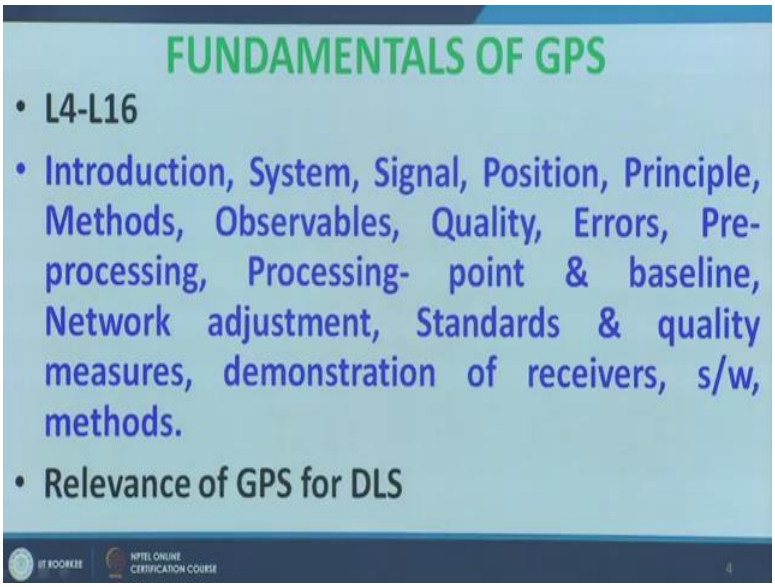

Now, i in these lectures I have talked about the what is GPS, what are the different components of GPS with special emphasis on the component which are relevant to user; that means, it is the GPS receiver and the software, and basically we make use of the signal propagated by the GPS satellites which we received by making use of GPS receiver with the help of GPS software; and this data which we signal which we receive GPS signal we receive.

We make use of the principle of analytical resection to find out the position of points, we get GPS position in WGS coordinate system that have been discussed and to collect the data we have to make use of different methods, and those has been discussed as a result of this collection we really get to fundamental observables that has been discussed; however, before we make use of the observables we need to know what is the quality and the quality of the (Refer Time: 07:06) observables depends upon the errors different type of errors that are associated with it.

So, I have discussed on this and to improve the quality of the GPS position, we need to first remove the errors. So, we should go for preprocessing and after the quality of the data to be processed is of sufficient standard, then we should go for it is position processing and processing has been done is being done generally by point processing or baseline processing, and later we go for network adjustment so that we can help our position of control point within the standard specification, so I have discussed about the standards different standards that may be or that should be adopted or that may be adopted, and how to measure the quality of the position and also in between the classes I have demonstrated the different GPS receiver.

So, that the participants have a feeling really how it does looks it look and then also I had also demonstrate the different software which are used for operating the GPS receiver as well as processing the data to end up with this GPS position and the matters that we generally adopt for establishment of control point. So, now to summarize it actually for establishment of control point using GPS first you should know what is the specification standard which we have to achieved for our control point depending upon the specification a standard to be achieved we should first plan our GPS surveying work.

Now, to plan the surveying work we should make use of some planning software, which provides us the possible observation windows session and other detail about the availability of the GPS satellites as well as the quality of the data we may expect to have. And then after planning we should go for actual location of our station points, and those station points has to be good enough to not to have multi path and other criteria has to be satisfied, then once this is done then we should go to the field for actual observation and during observation we should go for some initialization process, we should place the instrument properly over the location of station before that we should also select the

instrument of proper quality, so that the data which will be collected using GPS should have the capability to met the requirement of the specification.

In case of establishment of GPS control point, we should go for frequency receivers preferably multi frequency receiver and we should go for static method of surveying, we should go for epoch may be of higher division may be 15 second thirty second, but we should say that the (Refer Time: 10:56) should be list like one between one to two or one to three, and then our cut off angle should be as per the need of the field the station should be free from any electrical interference or reflecting surface around. So, these are the some salient points we should look into, and we should take the observation duration as large as possible and before we took the observation we should know how many GPS receiver will be using so that our observation design or observation scheme should be properly followed.

So, all those thing we have to do once the data has been procured then we should test the quality of the observables, and that has to be tested by making use of the quality measures and then once our data has been satisfactorily procured then that data has to be transfer to the office computer through interfacing software, and depending upon the requirement like if you want go for post processing, we should prefer for scientific post processing and we should go for precise ephemerides and precise ephemerides should be preferred to be taken after 15 days. So, if you want used really do a very high order high quality GPS topographic surveying then our establishment of control point should be done, at least 15 days before the total station work or detailing work.

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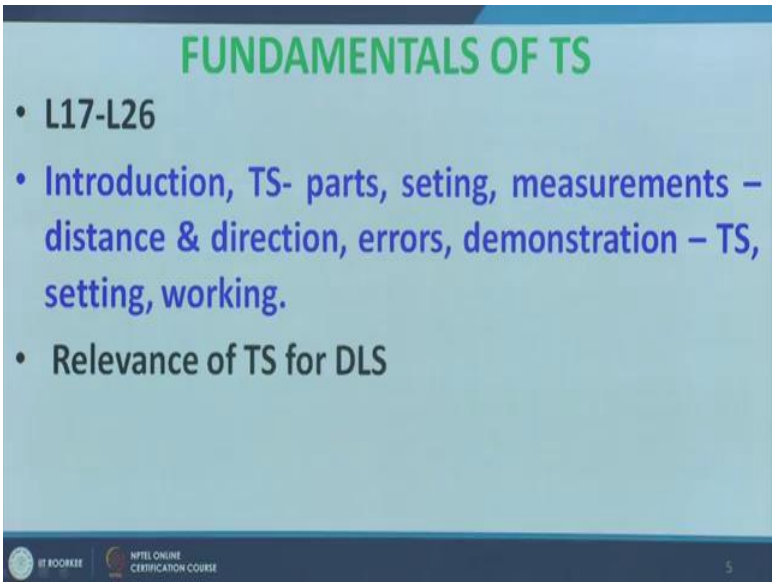

So, this is what we have learnt from fundamentals of GPS, then we have discussed about the fundamentals of total station and fundamentals of total station in this we have the lecture number s17 to the lecture number 26, in which basically I had demonstrate and should discussed in detail about a different types of total stations, and total station generally make use of a reflector or sometimes we can be used in a reflector less more.

Of course before setting the instrument also we should test whether the total station is permanently adjusted or not then I have discussed about the different ways how measurements can be done using reflector without reflector, the measurement parameters are horizontal angle slope distance and direction may be horizontal angle and vertical angle and distances the slope distance I have discussed about the different errors that is involved in tip total station, then I have actually demonstrate the a total station and it is working and operations.

Whatever we learnt from this is that, in case of digital land surveying the detail information about the land surface; that means, the different objects present on the land surface. We do collect by making use of a total station the depending upon the specification of the data to be obtained, we have to select the type of the total station and after selecting the total station first we should ensure that the total station is free from permanent adjustment, and then we should make use of reflected preferably if the distance of the object is more and in some inaccessible areas we can make use of

reflector less or more, but provided the distance that mean of the inaccessible point or object is less.

After that we had discussed about the different errors that may appear in our defined surveying measurements and it is propagation, and in the lesson number 27 and 28. So, what we have found in this that there are different types of errors and it gets whenever there is error in some measurement of GPS parameter that gets propagated to the computer parameter.

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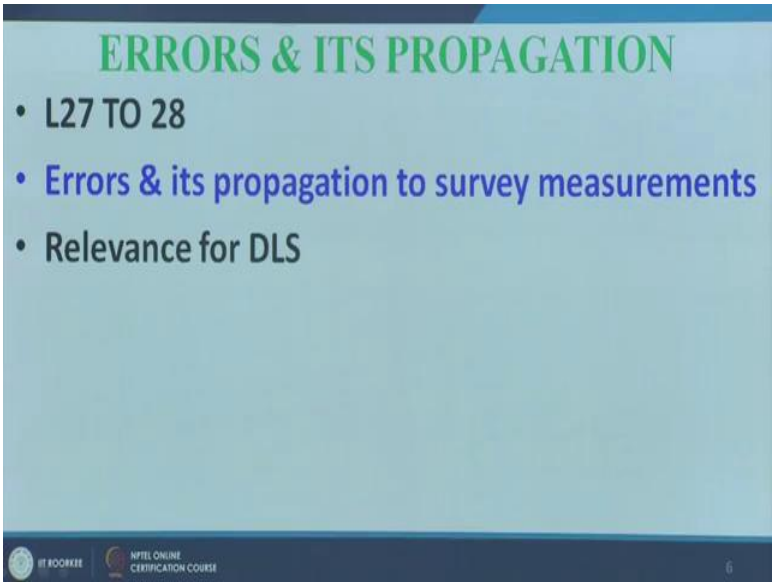

As a result we should know what is the way, how does it get propagated, because this specification of the surveying map will depend upon not on measurement but on computer parameters.

So, to satisfy the need of specification for mapping data, this lessons are very important and we should see whether the amount of errors in measurement lead to error in computer measurement, and whether within the specification to be mapped for the data to be prepared used to be used for mapping.

Later next the all our engineering survey demands to have the map in 3 dimensional depiction, but because map is a plane surface. So, it is not possible the way it appears in the field. So, we need to know how to represent the vertical dimension third dimension in

a two dimensional survey that has been discussed in lesson number 29 and 30 and in case of civil engineering projects all most of topographic map.

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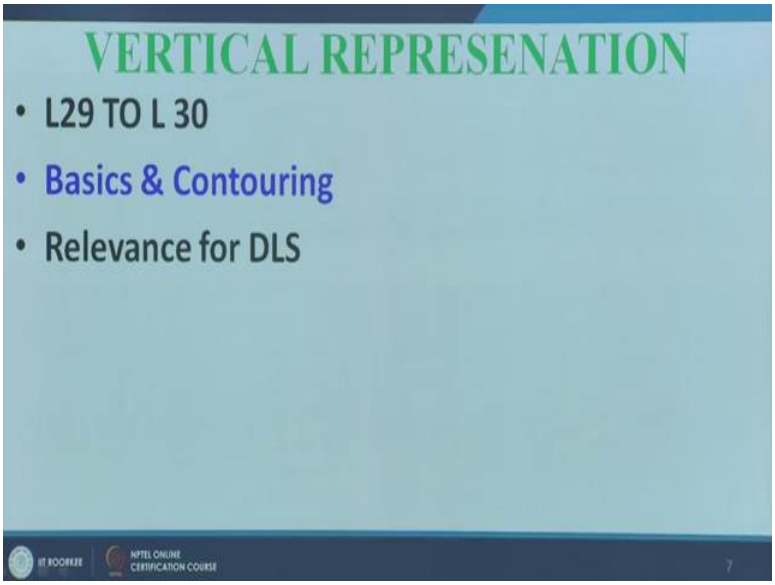

Generally we make use of contouring or contours to represent the vertical dimension and that has been discussed in this class.

So, whenever. So, digital land surveying when we will go for land surveying, we should also know what should be the scale of the vertical representation that is termed as contour interval and depending upon the scale for vertical representation, we should also do our digital land surveying; that means, detailing; that means, during detailing we should also collect information about the spot levels, and the frequency and the quality of the spot levels should be as per the need of the vertical specification that is contour interval.

Then once the data has been collected by digital land surveying; that means, once the control plan has been established and then from using the control point we will go for total station to collect the detail information about the objects as well as spot levels; we will now go for mapping representing the measurement. So, to represent the measurements in a map in the form of a map we need to know some fundamentals and that is in discussed in lecture number 31 to 34, and in case of digital mapping actually we make use of some software which really does the fundamental works of course, still now we need to have many interfacing work to be done by the operator and the quality or the

nature representation about the whether the representation is correct or not, and many other activities that the software does need the interference of the operator.

However many of the works we do using the software. So, we need to know about the software's also and also we need to know what is the sequence of steps that has to be done by making use of software. So, all these has been discussed in this lecture number 31 to 34. So, in case of our digital land surveying and mapping once the digital data has been collected and made it relevant to for mapping, then first thing we need to whether the data has been collected to be represented satisfy the we will be able to satisfy the specification of mapping or not that has to be tested; and for that testing we need to know what are the specification really we need to have for our mapping like the most important specifications are the scale of representation, it is the horizontal scale representation or planimetric scale representation and the vertical representation that is contour interval.

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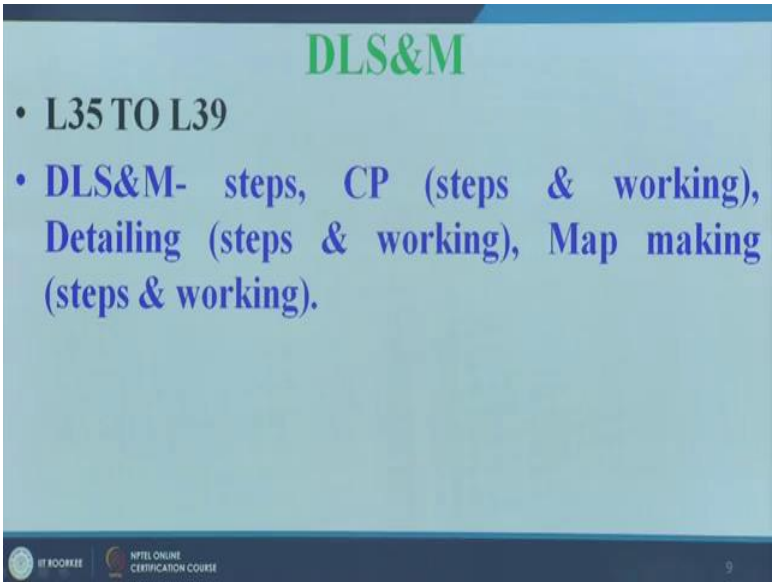

Finally I have discussed about the digital land surveying and mapping in detail, steps also I had demonstrate a few things most of the things I have also demonstrated and ultimately I end up with a map which is a topographic map, and that has been done in lecture number 35 to 39. Now in the beginning I had discussed about the digital land surveying and mapping. So, in digital land surveying and mapping I had shown that the how to establish a control point using a GPS, we had used a geodetic GPS receiver to establish the reference receiver on a reference station on the (Refer Time: 22:05) of our

monopher building and then I had shown how to setup the instrument over the station then once it is setup then we have to make it on and then after making it on we have to go for opening the project and then we have to setup many initialization parameters.

Then once the parameter has been setup then we should say what is the epoch of observation what is the cut off angle all those thing I have shown, and then we had left the instrument for it to observe the data take the data. And then I had also shown another receiver which has been placed as a rover receiver and then we have to taken the data, but further I had shown that the reference receiver first we will like to establish the location of the station with respect to IGS station which are spread all over the world and they are tamed as VRS virtual reference system, actually the that due during duration world we have taken the observation for our reference station also we have there are hundreds of receivers which are taking observation all over the world at the IGS stations, and we try to find out what are the receivers what are the IGS stations where receivers are collecting the data during the same time when we are collecting not only that the pop of observation of both station should be equal to or less than what we are taking.

For example, we have taken the epoch observation thirty seconds, then the IGS station +data should be available at an epoch of thirty second or less; that means, may be 20 second 15 second like that. So, after identifying the VRS we have process the data I had shown it, and once the not only we have to download the data of IGS station also the actual coordinate of the IGS station has to be downloaded.

Now, we have to during processing the location of the IGS station will be obtained from the measured value and that has to be substituted by this actual value, then we should go for processing of that data with respect to our reference data. In that way we will able to place our location of our reference station with reference to IGS station, once that is done then we can say that our control point has been established.

Once the control reference station control point has been established then in our project if there are some other control points then those points we should establish with respect to reference station, using the same method only thing is that in in this case we have to make use of our own data, and these can be improved as I told you by taking the precise ephemerides data.

Once the data has been procured the data will be avail then location of the control points will be available in WGS rectifier coordinate system which is either Cartesian or in geodetic system, and then to make use of that control points in our detailing purpose first we those points WGS rectifier coordinates are to be converted to has been converted to our north east and orthomatric height; and for north east orthomatric height I had shown you that it has to be first converted to north east orthomatric height by making use of some other software, where it will be required to give these control point location data as well as the projection system u t m location of the data like 43 and I had given for our place, and you have to give the geode model to which we have to convert the orthomatric height if you do not have local geode model then we should go for global model like e g m geode; by making use of that our WGS rectifier coordinate of control point has been converted to north east and orthomatric height.

Now, we should go to detailing part using the total station and we should go for I have shown you that for detailing work we can go either by radiation method or by intersection method, in the radiation method we will setup our instrument in one control point whose location already we now available in the north east and orthomatric height, then we should go to back side to some other control point whose location has also been established by using GPS and converted to n e h. So, the both this both of this n e h coordinate will be given one as a station point another is a back side point, and then we have to start the detailing that has been shown you in the detail in the field.

So, once the location of the different points has been collected that has been that will be stored in the total station memory as a digital data, also I had discussed that if we cannot sometimes we may not be able to setup our instrument or it will be judicious as per the field to setup instrument at some other points other than the control points. But at least two control points should be visible and preferably 3, and I have shown you how to get the location of the instrument location from the control point location by method of resection.

So, once the instrument has been setup by method of resection than the location of the instrument will be obtained from the location of the control points, and then we can do my method of radiation collection of different detailing data. So, that has been shown you once the data has been collected all these data will be available in digital form then all those data first has to be checked about the quality, as I told you as per the

specification whether these data is meeting the specification or not. If it is fine if it is not then we have to go revisit to the field and take the data with better quality.

Now, once the data is available digital data is available for mapping purpose, then those data will be imported to mapping software now mapping software I had shown you that we can it can be independently (Refer Time: 29:44) planimetric mapping independently contour mapping, then we can map together to go for topographic mapping in some other cases it may be your 3-D topographic map.

So, whatever it is most of the working steps same in fact, make making the planimatric map contouring map will be more detail. So, I have taken up that as a case study, and once the map has been prepared then we should go for detailing of these map like orthographic elements the most important things that has to be represented in the map is the scale and preferably graphical mode of a scale, and the north direction the listened chart these are the things which are very important and we have to note it down.

So, this is what we have discussed in this course, hope you had understood many of the points and if you go through something more from these books you will able to have more understanding about the content of this course; hope you enjoyed this course and we have learnt and you will able to implement this in your future life.

Thank you.