Engineering Econometrics
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Lecture – 07
Exploring Data on Spreadsheets (Contd.)

Hello everybody and this is Rudra Pradhan here. Welcome to Engineering Econometrics and today we will start with the unit 2, that too the use of spreadsheet as per the requirement of you know, engineering econometrics. And this is the second lecture in the unit 2 and in the first lecture, we have already discuss the kind of you know data, the use of data and that too how to use excel for reporting the data and a creating a kind of you know structure through, which you can do the data analysis.

In this lectures, specifically will be highlight more something more about the excel functions to report the data, transfer the data and prepare a kind of you know structure through which you can do the data analysis more effectively, more efficiently and as per the particular requirement.

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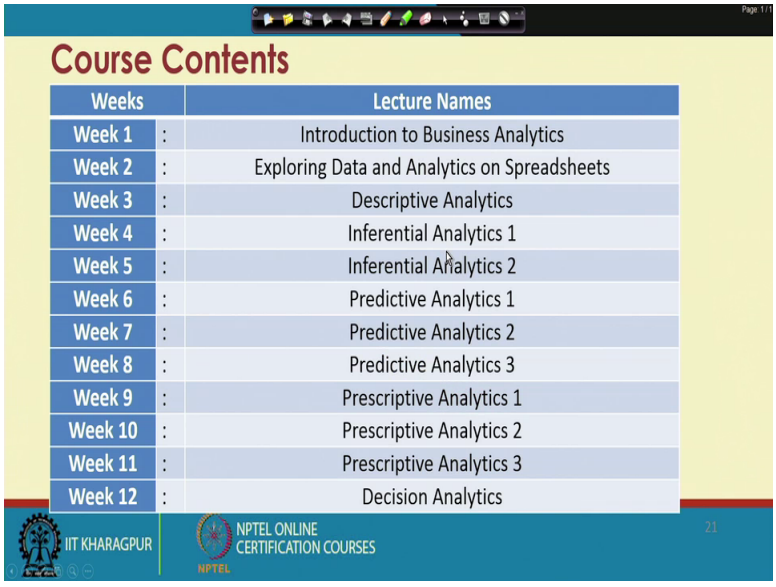

So, accordingly, so the highlight of the lecture will be like this.

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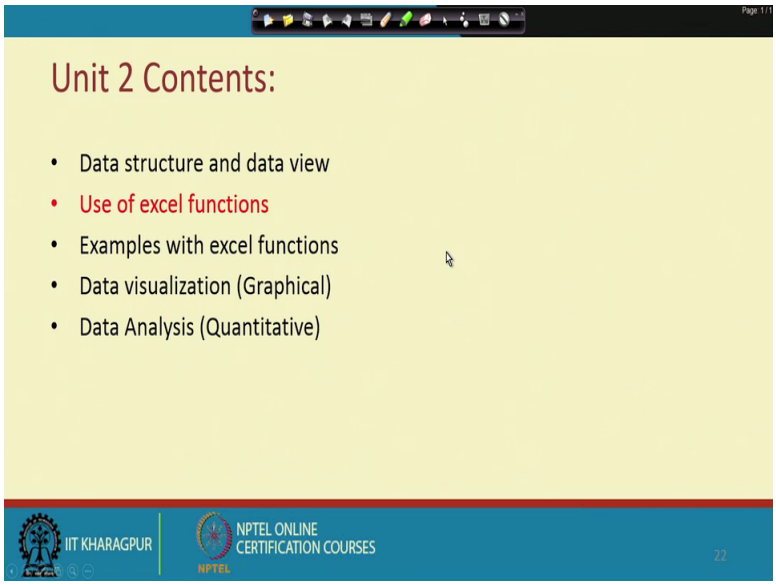

So, the specifically, the kind of you know of use of excel functions, specifically in the last lectures, you know in fact, we have discussed something related to the structure of you know excel, how to create excel file, how to open the excel file, how to copy, how to paste, how to save, how to transpose, how to transfer. So, so many features are there and so for as a engineering econometrics is concerned, so it is the you know the, basic requirement is the data analysis means that is one of the major part of this you know engineering econometrics process.

And until unless you know the kind of you know excel requirement or the functionality of excels, so, you may not be in a position to analyze the data perfectly because some of the sophisticated softwares needs you know data structuring, data transformation. So, excel is the first and kind of you know spreadsheet where you can report the data and then you know transfer or you know structure the data as per the particular technique requirement and the kind of you know engineering problems requirement.

So, in response to last lecture, you know the way we have use the excel structures like you know opening file a, you know saving file, importing file, exporting file. So, so many features are there and you know once you know all these features, then you will get something you know you know positives, how to you know go ahead with you know data analysis.

And in the excel sheet, we have a two different parts all together and that is the data analysis package and that too the use of statistics and the use of mathematics. So that means, we have a couple of statistical functions and we have couple of mathematical functions in the excel spreadsheet. So, once you know all these details, it will be very easier you know for you to solve sum of the problem, you know as per the particular you know engineering requirement.

Of course, we will use some of the advance softwares like a Gretel, sas, data, r, matlab and the basic operations you know you know the kind of you know homework or the kind of you know examples you can actually report and do these kind of you know structuring and for that excel is very handy and once you know very familiar with excel, then the use of other softwares you know may not be very difficult.

Because some of the a software, statistical software or econometry softwares are you know am very complex and sometimes you may face you know difficulty to understand and the kind of you know you know reporting and the way of you know doing the data analysis. So, if you are acquainted with excel sheet, then it will be very you know, it will create a easy path for you to use the advance software for here you know engineering econometrics problem requirement and the data analysis requirement.

So, in this lecture specifically, we like to know some of the excel functions and through which we can actually a you know structure the data in a more effective way, more you know you know efficient way. So, let us see here, the kind of you know structure what we can do in the process.

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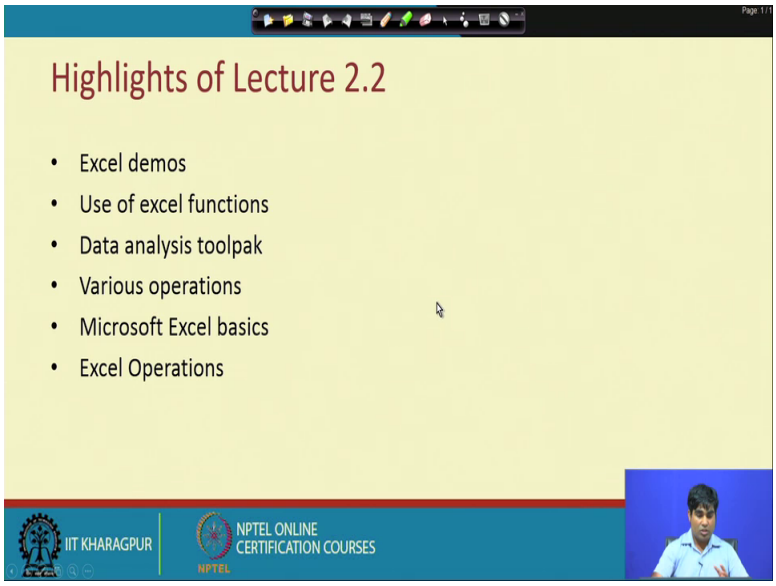

And basically, we will do some kind of you know demos, then the nature of you know excel function, then I will let you know something related to data analysis tool pack, then Various operations and Microsoft excel basics and then the kind of you know some of the excel operations.

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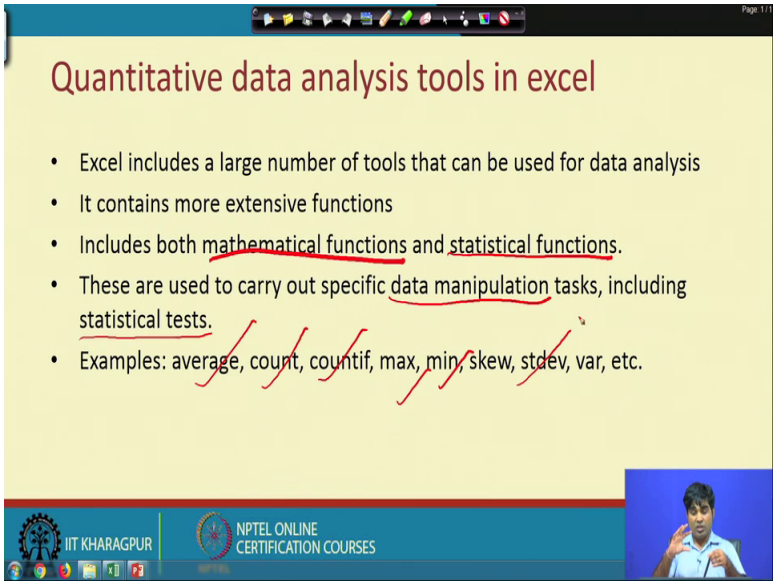

So, there are two things in the engineering econometrics problems or something right you know the analysis of you know the engineering problems. So, so far as a you know engineering econometrics is concerned, what I have already mentioned, data analysis is

one of the major what we can say organ. So, when you go for you know data analysis as per the particular engineering econometrics requirement. So, by default, we have two different structure altogether.

In one particular structure, it is called as a qualitative data analysis. Another structure is called as a qualitative data analysis but qualitative data analysis, the structure is you know which we have already discussed somewhere. That is you know some of the engineering problems where you may not have any idea about the variable specification, the kind of you know information which you need for the kind of you know analysis but qualitative data analysis structure is you know, you try to find out you know process through which the particular problem can be quantified with the help of some qualitative variables and then we should get to know how this qualitative variables can be quantified in the form of you know coding or something like that.

So, then ultimately, the qualitative problems or qualitative informations can be quantified. Then ultimately, at the end of the day, so, we do data analysis and that too the kind of you know structure called as a quantitative data analysis. So, that is how, knowing quantitative data analysis is you know too many advantages. So, whether it is a you know quantity problems or qualitative problems ultimately, you are we are supposed to do the data analysis to get more insights and you know better way of you know explorations, better way of you know investigations, better way of you know kind of you know experiment, experimenting the things.

So, that is how, it is a mandatory to know the data analysis package; whether it is a kind of you know excel or it is the kind of you know any softwares like Eviews, Microfit, MATLAB, etcetera. So, the thing is that you know you should know the mode or the kind of you know kind of you know infrastructure through which you can do this a particular you know data analysis. So, let me highlight something related to quantitative data analysis here.

First of all, we are in the process of you know spreadsheet use and that too the use of you know excels for data reporting data structuring and you know data transformations. So, in some excel includes large number of tools and that can be used for data analysis. It contains more extensive informations where it has you know both mathematical functions and statistical functions. I will show you the kind of you know excel

spreadsheet and I will also give you the hint who had the mathematical functions are there and what are the contents under the mathematical functions and do what is the statistical functions and what are the contents under the statistical functions.

In fact, if you upon simply, you know excel spreadsheet and if you click the data by default mathematical functions and statistical functions will be there. So, mathematical functions like you know how to you know you know calculate a particular value. For instance, let us say there is equation, y equal to x x plus b where you know x is availables and you know a is available and b is available, then how to you know get y value with the help of x, a and b.

So, now, if you have a spread in heavy you know data set; that means, this size of the data is very worst. So, manually you cannot do. So, you just enter the kind of you know process, then excel will help you just you know give the commands. So, then automatically it will generate spreadsheet for you as per the particular you know information and the kind of you know particular requirement. So, you know it is a kind of you know infrastructure and it will help you or monitor you as per your, you know requirement. So, the spreadsheet need some kind of you know command from you, how to use, how to process and what is your, you know kind of you know requirement.

So, mathematical function, statistical functions will be like that only. For instance, in the statistical functions you need actually reporting of you know mean or you need to be reporting of you know maximum value or minimum value something like that. And in the mathematical functions, you can calculate you know square root of the particular you know data or something kind of you know square of the particular data, log of the particular data. So, these are all the kind of you know transformation and structuring.

So, you need to do through excels. Of course, some of the software can do all the same operations but excel is much you know you know which what we can say that you know it is more user friendly and you know some of the softwares, it is not so user friendly. You need to understand the software very perfectly, can do the analysis but excel is so you know user friendly.

So, you just enter and you know give the command, automatically it will come. So that, that means, technically, compared to compared to different statistical and econometrics softwares, excel the understanding of you know excel and the use of excel is very easy

and sometimes I can say that you know or I can recommend that you know this is the mandatory kind of you know requirement for other softwares. If you do not understand the entry of data, this you know the structure of the data in excel, then I am very sure you will face lots of difficulty to operate some of the advance you know tools like you know sas, stata, eviews, microfit, gretel, etcetera. So, technically, so, it is easy means it is better to know this particular you know spreadsheet and then the kind of you know you know it is operations.

So, they are used to carry out specific data manipulations like you know say encoding, you know statistical test. For instance, you know what I mention; so, there are two operation; mathematical functions and there are statistical functions and will carry out some kind of you know data manipulation means data structuring, destructuring, data transformation.

So, that is how we use the term called as a data manipulation. And including, some of the statistical tests and some of the examples like you know reporting of average, count means number of items, count if the conditional kind of you know for instance, how many items above then average, how many items below then average, how many items compared to you know some you know range.

So, then maximization, minimization, spread, spread of these series and a variation of the series and so, you know you know and so on. So then, that means, technically, it has you know many more features which you can have here and that is that is very very essential and very useful for data analysis and that too the use of you know econometrics tools or econometrics softwares for solving some of the engineering problems.

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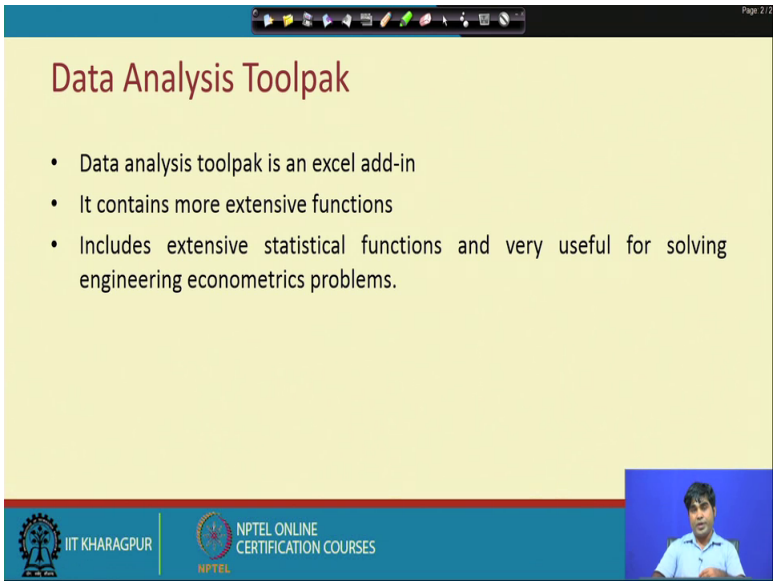

So, technically, so we like to know all these things. So, so one of the thing is you know data analysis tool pack in the excel. So, mathematical function, statistical functions are separate entity all together but in addition to that, you know we have a package called as data analysis tool pack and another package is called as you know excel start. So, both are very you know very very much you know mandatory and very useful for the data analysis.

Some of the simple engineering problems, you can do through data analysis tool pack and some of the complex problems and the complex advanced tools can be solved through excel start. So that means, excel spreadsheet has a data analysis package. So, one is called as a data analysis tool pack, that is a simple to understand simple to work out and similarly, we have a excel start which can be also user friendly and some of the problems can be analyzed through you know excel start.

So, what will you do once we have some kind of you know engineering problems which will start after you know one more you know unit where you know, we can use some of the sum of these tools and then we can use some of the advance econometrics tools to solve the engineering economy problems. Once we start, you know some advanced statistical package to solve sum of the engineering problems, that time you can get to know the beauty of this you know excel means knowing the functions and the kind of you know functionality of excels for the data operations or you know data analysis. So, it

includes you know the, you know extensive function like you know statistical functions and very useful for solving engineering econometrics problems.

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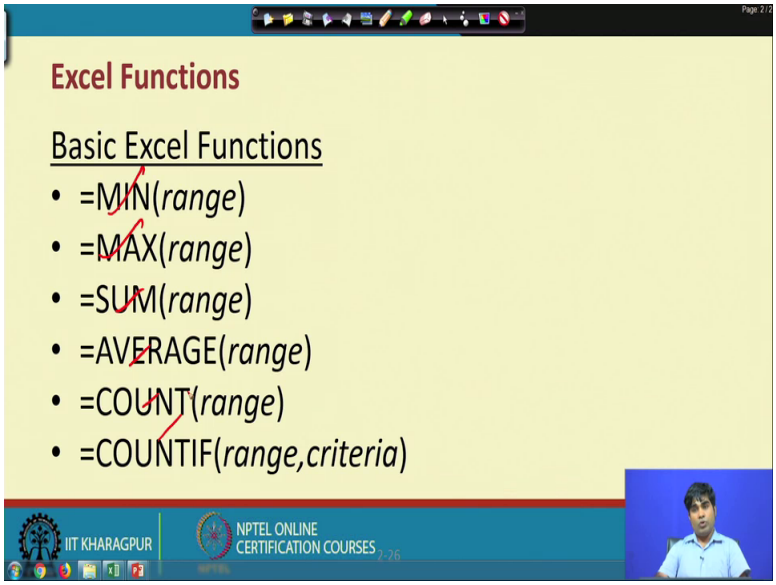

Like you know some of the excel functions are like this; minimum to find out minimum of this particular series. Of course, you know if you are if means if you have no idea about true, you know statistics or something you know basic mathematics, then knowing all these terms may be little bit difficult but these are all you know what we can say that you know basics for engineering econometrics or whether it is a kind of you know knowing the excel spreadsheet or solving sum of the engineering problems.

Now, nowadays, you whenever you talk about any kind of you know engineering problems and there is the reporting of the data to the engineering problems corresponding to some of the decision variables and knowing all these items, these are the basic items or what we can called as you know statistical indicators or mathematical indicators through which you can you know analyze the engineering problems and predict the engineering problems as per the particular you know objectives and the kind of you know requirement.

So, if you have no idea about the basic you know math maths and basic starts like you know, minimum of the series, maximum of the series, sum of the series, average, count, countif. So, you know just you assume that you know. So, these are all you know basic requirements and you are bound to know all this things before you go to the advanced

data analysis for the engineering econometrics problem in the kind of you know requirement.

So obviously, so, you are supposed to know all these things and I will be show you in the excel functions how you can operate all these things with a kind of you know spreadsheet.

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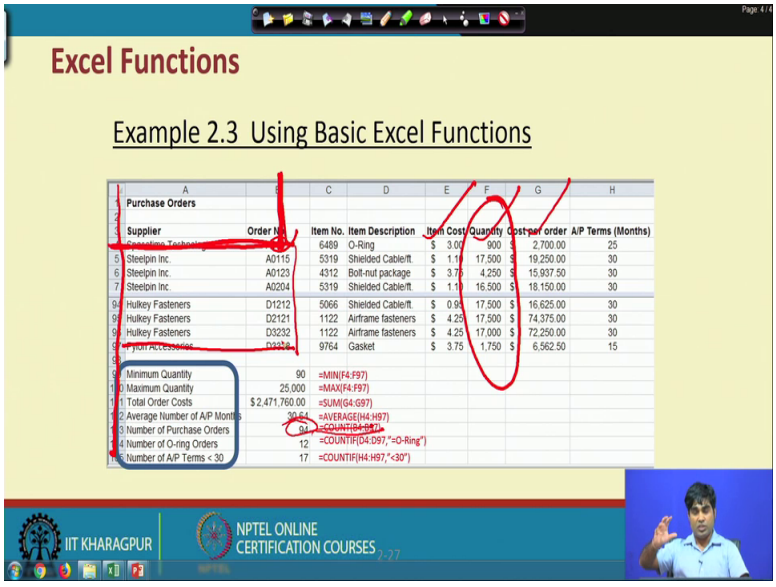

Let us say that this is a kind of you know spreadsheet and in this case, you will find here, this is a sum of the engineering reporting and you can say that you know this is a completely operational management problems or you know operation research.

So, where it is a reporting of you know suppliers informations and the kind of you know order information and where you will you will find the suppliers informations are here and there are you know difference different you know purchase order. So, different kind of you know suppliers and all are you know coded or something you know item wise reporting or something like that and the item cost, item quantity, cost for orders and you see heres, what is the beauty of the kind of you know excels use.

So, for instance you know just we can you know report the order quantity and yes you can rip you know you can report all these the order quantity in a kind of you know plain papers but you know reporting in you know reporting in excel has a kind of you know multi use or you know multiple benefits because this will be generating process through

which you can we can calculate sum of the indicators through which that you know the operational management can be, you know effectively, you can say analyze.

And in the same times, it may be useful for sum of the other operations like you know engineering econometrics or engineering statistics something like that. And here, you see heres, whatever I have discuss the kind of you know indicator like you know minimum, maximum, sum, average, count, countif, it is like that you know.

So, for instance, so let us, let us just you know what we can, let me clear this. So, let us we take you know consider consideration of you know one particular you know item quantity. So, that means, here lots of informations are there and so far as a data part is concerned, this can be a data reporting, this can be a data reporting and this can be data reporting. So, this is the cost items and this is the quantity items and this is the cost per per order.

So, that means, so these are all you know orders, then you just you know divide then automatically you will find you know cost per order. And what is happening here is, suppose the cost is a reporting for you know some of the some of the, you know orders here order numbers. So, there are you know around 8 different orders number. So, that means, if you know how many how many such orders. So, you just put you know count ok. So, just indicate you know for instance, this is count B 4 to be 97. So that means, so, this is what actually B 4. So, this is what actually B 4, you see here, row wise and column wise information.

So, this is column B. So, B information and this is row. So, B 4 means indication is like this. So now, this is the starting B 4 and then you will be find B you know 97. So that means, up to this one. So that means, we start with B 4 and then it is actually the series up to B 97. So, this means in between some cities are there, we hide it actually, be otherwise you know we cannot visualize here.

But you know that does not mean that you know, it will erase completely, it will be there. So, when you give the commands automatically software has the beauty or excel has the beauty to a you know recognize and you know report you as per your you know particular you know requirement and that particular you know reporting will be very correct and very perfect also. So, now, suppose B 4 to B 97, so you need to know how

many such order numbers you know that is count. So, if you give the you know kind of you know structure, then by default you will get the numbers 94.

So, that means, there are 94 you know orders. That is the count because here you cannot just forget about let us say this series is not available. So that means, only this codings are there. So, if this codings are there from you know just in a kind of you know box, so manually or by default, you cannot say that you know this is a 94 numbers or 100 numbers something like that.

So, so obviously, you have to count 1, 2, 3, like this or else you know you just give the command and get the quick answers. So, that means, for a you know kind of you know big data or something you know a complex kind of you know problems where the objective is very complex and these are all basics and for that you should not you know spend unnecessary times. So, you can just use the excel and then what are the basics requirement, you can get the informations very quickly.

So, so, so you once you get, I mean one to know the number order quantity, so you just give the count and then indicate the first entry and last entry. So, it will give you the exact you know answers. Similarly, you have the reporting from B 4 to B 9, 97 is that that is what is that is what we are reporting here B 4 to B 97. So that means, B 4 to B 97 is the entry.

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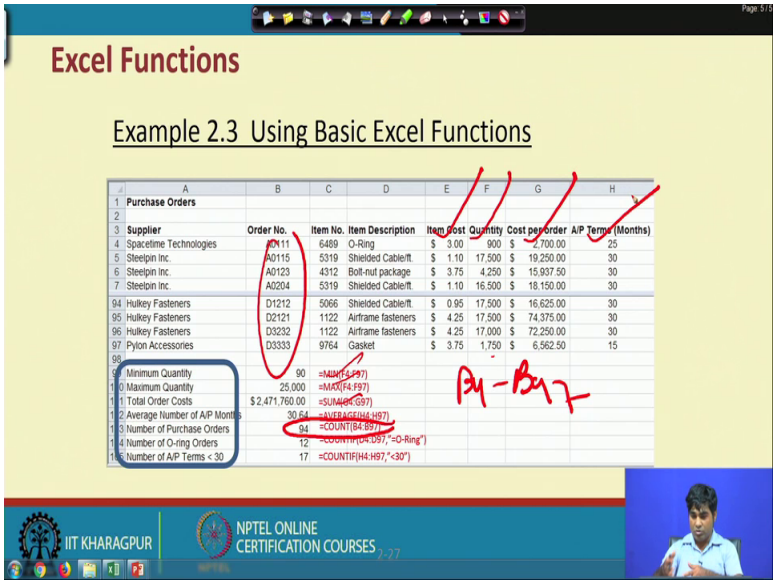

So, now, so this is a particular you know, particular you know data and that too that too for you know, order number order numbers. So,, so order number it is actually coding here and here the other operations you may not actually get perfectly but for that you know for instance, let us say minimum, maximum, sum, for that we need to have you know data like this.

It should be in numbers but here the there are numbers but in addition to that, there is a kind of you know symbols. So, that means, this is actually coding, order number. So, this itself will not give some kind of you know data analyses or something kind of you know big inference but it will give you sample specification all together but ultimately when you talk about the data and the data analysis; so, then, so this is this can be a variable, this can be a variable, this can be a variable and this can be variable.

So, that means, in the usual excel reporting, you will find you know complete informations you know. That is what the kind of you know requirement of you know engineering econometrics. You give you know all kind of you know entry or all kind of you know specification, so that you know anybody can you know go through this particular you know spreadsheet that they can easily understand the reporting and the they may not they may be in a position to analyze a you know as per the particular you know requirements.

So, now, this is the first hand information of this you know operation management but ultimately when you talk about to data analysis or engineering econometrics; so, the root will be start from here. So, what are the when you, so, means a technically when you talk about to data analysis or you know engineering econometrics, so you must have specific objective.

So, corresponding to the objective and the kind of you know data analysis requirement, so, you have to pick up which particular variable out of this you know reporting and how this variables or how this particular data can be used for further processing as per the data analysis requirement and the engineering econometrics requirement. So, that is why, so, you have to understand clearly all these things.

So, now, for instance, these are all you know reporting. So, the numbers minimum, maximum, sum, average, count, countif, countif; so that means, these are all you know, some kind of you know excel indicator or which you may called as you know statistical

indicator or mathematical indicators to you know to give some kind of you know information to this problems which can be very relevant for analyzing some of the engineering issues.

So, now, now let us take a case of you know cost, quantity and cost per orders something like that. So now, this is a cost. So, you can find out so many orders are there and you will be find, you know very interesting in the engineering. So, when you are you know having orders, different orders and your duty is you know take the order and you know fulfill this orders, then supply accordingly. So that means, taking the order and supplying the materials. So, by default, it is not actually free of cost. So, far as a management is concerned, on engineering is concerned, a every nothing is free launch. You must have cost and then ultimately, you have a different orders and I am very sure every order cost you know may not be same.

So, there is a high chance that you know the order cost will be different. So now, in case the order cost is a same, then engineering econometrics by default will not work. So, there is no necessity. So that means, the requirement of engineering econometrics for a particular variable or a for a particular datasheet, that there should be some kind of you know variations.

So, you need to know why this variation is happening. So, the rule of the engineering econometrics is to predict and forecast this variations as per the particular you know engineering requirement. But in the first instance, if the reporting says that you know there is no variations, then I am very sures, there is no such requirement of data analysis and no such requirement of you know engineering econometrics. So, that is why, you must be very careful you know how to understand this kind of you know problem and then you have to use this as per the particular you know engineering requirement.

So now, in this case, you know what I have mentioned that you know if the cost is a same or quantity is a same, then the data analysis or engineering econometrics will not work properly. So, if you look this a spreadsheet and if you look this spreadsheet, a for this you know cost is a variable here quantity is also a variable and cost per order is also variable.

So now, if you look this you know datasheet or you know means if you look this data for this particular you know variables, you will define these reportings are not uniform. For

instance, if it is 3.00, 3.00, for you know all entries for all orders, then this particular variable or this particular you know information, for this variables may not be very handy for the data analysis for the engineering econometric to solve sum of the engineering objectives or engineering problem.

So be ensure, in our be careful that you know when you are analyzing any engineering problem with the help of you know data for the decision variable. So, the information should have some kind of you know variations. If it is uniform reporting, then this particular spreadsheet or this particular you know data for any decision variable, even that variable is very important may not a very useful for getting any kind of you know new inference or a new insights as per the particular you know engineering. So, you must be careful, you know how you have to analyze this kind of you know structure to you know when the use of this particular you know data and the kind of you know analysis.

So, that means, you know a first of all you know what is the item you are targeting and what kind of you know statistic or statistical indicator or mathematic mathematical indicators you can report to work out all these things. For instance, in this case, the issue is that you know means this which I have raised that you know the data information or data reporting should be a should be actually not uniform. So, since it is not uniform.

So that means, we are in right track to do the data analysis and then look for the look as per the objective requirements or you know engineering requirements. But now, suppose you like to know something you know average of this cost for these orders, you know 94 orders and what is the quantity of you know order, orders, average quantity of the order, what is the average cost per orders or something like that.

Then some of these you know cost, some of these quantity, what is the maximum order and maximum you know order quantity, what is the minimum order quantity. So, all these specification you are supposed to know. If you I mean until unless you know all these details, you may not be in a position to predict here, you know operations or something you cannot forecast something a, you know the kind of you know requirements.

So, that is how you should know how you have to report and how to understand, how to analyze or something like that you know. So, proper reporting means, there is need of you know structured kind of you know reporting. So, that you know anybody can

understand. Even lemon can understand you know yes, this is what the data and this is how the data you know gives the kind of you know message. The way we are putting in the you know physical you know sheet, so we same thing we will report in your kind of you know excel sheet. That is called as you know, what do will called as you know it is a kind of you know, hard information and soft information.

So, the reporting of you know soft informations is very you know multiple use in fact, you know. So, just you trance import, export or something to kind of you know transformation. So, many things you can do actually. Now, if you have a physical sheet, manually everything you have to do and you know report but heres, just give the command and if you just do for one particular row and one particular column and then you know automatically give the command it will be available for other rows and other columns as per the particular requirement and the kind of you know the kind of you know needs or the kind of you know, the kind of you know data analysis requirement.

So, so that means, what I can say that, you know this very handy; how you have to use this operations and so that means, what I have mentioned you know.

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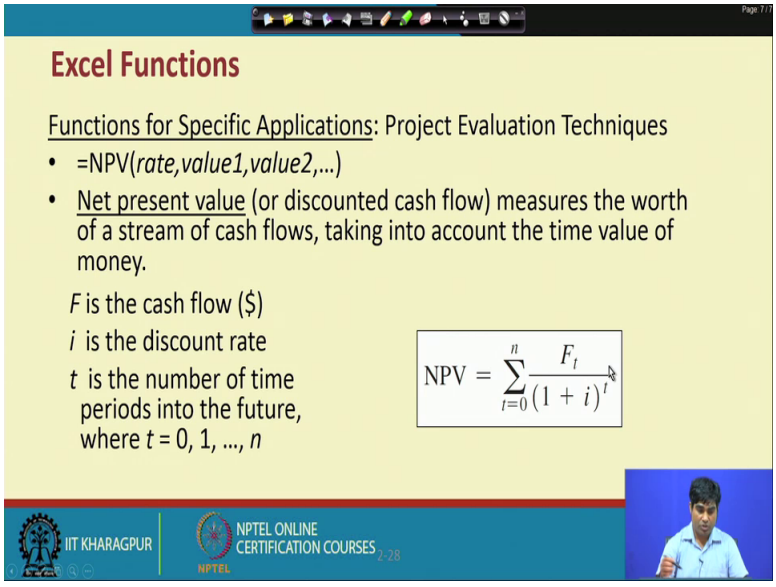

These are all various ways to report the kind of you know structuring and for instance I will give you the kind of you know examples. So, what I have mentioned that you know, in the excel spreadsheet a, you have mathematical function, you have a statistical functions and as per the particular requirement, you have to just give the command, pick

up the particular you know indicators, then solve the problems as per the objectives in the kind of you know requirement.

For examples, we have the kind of you know lots of you know engineering analysis or the financial analysis or operational analysis. So, here some of the things are like that you know, we have a called as a financial modules in the excel spreadsheet where you know some of the engineering problems. So, the need of you know financing or the need of you know reporting, the need of you know financial analysis, you know are very much you know essential and in fact, a the use of excel help you lot to get all these inference and the kind you know requirement.

And the excellent example is you know, the kind of you know what is called as you know project valuations or the kind you know capital budgeting something like that. So, the kind you know project valuation is you know, when you do the kind you know business or the kind of you know operations, any kind of you know engineering and you are doing something like that, so there is a cost and there is a kind of you know returns or something called as you know revenue.

So, now, when you do something else; so obviously, it is not free. So, there is a there is a money involvement and the amount of money you put in that particular operation is called as you know something called as you know cost. So, now, when you are putting money, it is a kind of; you know investment. So, when you are doing the kind of you know investment, you are expecting there should be a kind of you know return. So, so that means, any kind of you know engineering problems and within a particular engineering problems, there may be some of the means different problems solved together but a any kind of you know problems or any kind of you know issues you can target.

So; obviously, there is a kind of you know investment and there is a kind of you know returns. So, we like to check how is the balance sheet altogether. So, here means, usual requirement because in a engineering itself is a kind of you know business. So, when you are doing a kind of you know engineering business, so obviously, you have to see how much your putting the money and how much you are getting out of it. So, ultimately, what is the net results or you know net in your you know basket.

So, the need is a actually, your return should be a more than your you know kind of you know investment not necessary but obviously, the expectation should be like that and the operation should be like that or the kind of you know planning must be like that. Even if you not coming a something called as you know positive, still you know this will give you some kind of you know path to think.

How you have to actually transfer the, a positive things or you know positive outcome to here you know investment plan for a particular you know engineering problem. For instance, at the classic example is a kind of you know a component called as a NPV.

So, when we are talking about the kind of you know project valuation or you know engineering valuations then, obviously there is a cost and there is return and the balance is called as you know they something called as you know profit or the kind of you know extra returns or net return. And there are there are many ways you can you know analyze this particular you know investment, in a return or something called as you know cost and the revenue. So, there are many different you know technical components are there, engineering components are there through which you can analyze the problems as per the particular requirement.

So, NPV is a kind of you know component which can help you to go for you know engineering valuations or you know financial valuations or operational valuation and a the thing is that, you know means this is a kind of you know component where you will be find a when you put the money, it is not the it is not kind of you know one time or you know, 1 hour kind of you know investment or 2 hours kind you know investment or 1 day investment or 1 year investment sometimes, you know some of the a bigger kind of you know problems, when you talk about you know big data something like that.

So, it should be long term objective or long term investment; so obviously, when you are putting the money, so, the return will be coming over the years and then the problem complexity will start increasing. When you are when you are doing a kind of you know one day business or one day investment and one day returns, then the situation is very simple and it is very easy to calculate and there is no extra unders I means the complexity and extra understanding is not required but when you are putting a money for you know 10 years or you know 50 years or 100 years down the line, so, that times you will define many many other things come into the pictures.

In that case, excel will help you how you have to calculate integrate all these things and you know do the kind of you know final balance sheet all together. And a manually, a or you know theoretically you cannot just analyze because some complex problems when a particular variable having 100, 100 years plan and then a particular variables within 100 years, there are many other you know integrations with you know other variables other requirement, costing something like that. So, that, that means, technically what I like to say that you know the complexity will be very high.

So, when the complexity is very high that times, so, you need actually something called as you know you know data analysis or something you know technical help, how to steamline the process and then come with a kind you know outcome or you know analysis through which you can analyze the problems as per you know your requirement.

So that means, technically what I like to say that you know, excel spreadsheet has a lots of you know positives or you know some kind of you know beauty through which is some of the engineering problems can be analyzed very effectively. So, that is why it is a mandatory that you should know the use of you know excel and the kind of you know operation of you know excel to solve some of the engineering problems. We will stop here and in the next lectures, we will continue from this particular you know component.

Thank you very much. Have a nice day.