Lecture 38 - Demo on project management software

Dear students, in this lecture I will give you a small demo on how to use a computer to create a small demo on MS project management software with the help of two examples. The previous class I have given you the overview about the various software project management. Then I have given you a small introduction about how to do resource allocation. In this class I have taken two examples. One example is for finding the critical path and scheduling of each activity and the next problem is on resource allocation. So the agenda for this lecture is first I will do some basic configuration before you start in the MS project management software.

Agenda

- Some basic configuration before you start
- Example 1: Scheduling a simple project
  - Precedence relationship
  - Total float
  - Free float
  - Demo in MSP
- Example 2 : Resource Allocation
  - Resources
  - Allocation of Money
  - Allocation of Crane
  - Change in duration
  - Over allocation
  - Report- cost overview

And the first example is for scheduling a simple project. There I have entered various precedence relationship, then I will explain what is a total float, free float, then I will give you a demo. In the second example I have taken a very small problem on contraction project. Here I will explain how to do the resource allocation, what are the resources.

We have considered one resource called money, another one is crane and one more resource is called manpower. And once we allocate the resources for an activity, suppose we allocate more resources that will affect the duration of that activity. Suppose duration of activity say 10 days, so two people can do that work. Suppose if you allocate more people, say 5 people for doing that activity, from 10 days it can be reduced to maybe 9 days or 8 days. So what will happen when you allocate more resources, the duration will decrease or it will increase.

If you allocate less resources, duration will increase. The next another part sometime there is a chance we can over allocation. So over allocation in the sense that resources are more utilized. So we allocate more than what is required. Then finally I will show you how to get a report from the MS project.

Some basic configuration before you start

- Setting change 1: Make Auto Scheduling the default

- Setting change 2: Enable immediate calculation

So some basic configuration before you start MS project what you have to do. First you have to make auto scheduling is a default. So in MS project there are two way to schedule it, one is manual scheduling, another one is auto scheduling. When you do auto scheduling

it automatically calculate all the project completion time of each activity. The second one is we have to enable immediate calculation in the options when you go to file options.

Example 1

- An established company has decided to add a new product.

- It will buy the product from a manufacturing concern, package it, and sell it to several distributors that have been selected geographically.

- Market research has already indicated the expected volume and the required size of the sales force.

- The steps shown in the following table are to be planned.

Sharma, J. K. (2009). *Operations research theory and application.* MACMILAN Publishers.

There are so many settings there, there you have to check this, you have to enable this option. So the first problem is on simple scheduling problem. So the problem is like this. An established company has decided to add a new product. It will buy the product from the manufacturing concern, package it and sell it to several distributors that have been selected geographically.

Example 1

| Activity	Description	Predecessors	Duration (days)
A	Organize sales office	–	6
B	Hire salesmen	A	4
C	Train salesmen	B	7
D	Select advertising agency	A	2
E	Plan advertising campaign	D	4
F	Conduct advertising campaign	E	10
G	Design package	–	2
H	Setup packaging facilities	G	10
I	Package initial stocks	J, H	6
J	Order stock from manufacturer	–	13
K	Select distributors	A	9
L	Sell to distributors	C, K	3
M	Ship stocks to distributors	I, L	5

harma, J. K. (2009). *Operations research theory and application.* MACMILAN Publishers.

So market research has already indicated that the expected volume and the required size of the sales force. The steps shown in the following table are the activity that are planned. So activity A, B, C, D up to M is there and there is a description of each activity like organize a sales force, hire sales man, train sales man, select advertising agency, plan advertising campaign, conduct advertising campaign, design package, set up packaging facilities, package initial stocks, order stock from manufacturer, select distributor, sell

distributor, then ship stocks to distributors. And the precedence also is given here and what order these activities are taking place and the duration of each activity is also is given to you. So when you plot that precedence relationship it goes like this.

Example 1 Precedence relationship
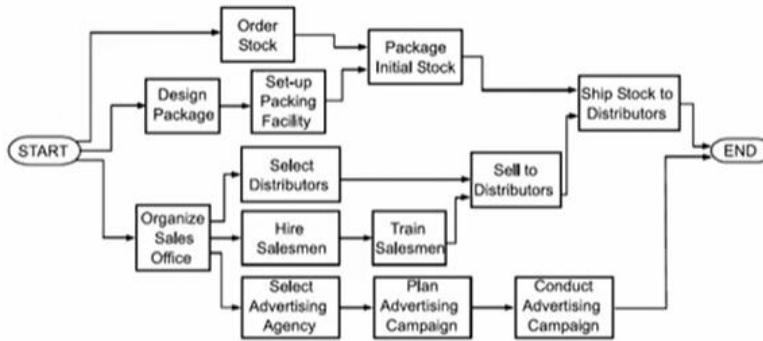
Sharma, J. K. (2009). *Operations research theory and application*. MACMILAN Publishers.

Start design package, start of package facility, then package initial stocks. So there are different way of, these are different events finally the project will be end. So this picture has drawn by looking at the our precedence diagram. So what we need to calculate? We have to draw a GANTT chart for this project, then we have to indicate the critical path, then we have to find out total and free float of each non-critical activity. Then what is a total float? Already I have explained but one more time or slack, one more time I will explain to you.

Questions

(a) Draw a Gantt Chart for this project.

(b) Indicate the critical path.

(c) find the total and free float for each non-critical activity.

Total float

- This is the length of time by which an activity can be delayed until all preceding activities are completed at their earliest possible time and all successor activities can be delayed until their latest permissible time.

- Total float $(TF_{ij}) = (L_j - E_i) - t_{ij} = LS_{ij} - ES_{ij} = LF_{ij} - EF_{ij}$

So this is the length of the time by which an activity can be delayed until all preceding activities are completed at their earliest possible time and all successor activities can be delayed until their latest permissible time. So total float is, so difference in latest start time minus earliest start time, otherwise latest finish time minus earliest finish time. So this is the formula for finding the total float. The next one is a free float because in MS project only these two floats are visible to us. So this is the time, free float is the time by which the completion time of any non-critical activity can be delayed without causing any delay in its immediate successor activities.

Free float

- This is the time by which the completion time of any non-critical activity can be delayed without causing any delay in its immediate successor activities.

- The amount of free float time for a non-critical activity (i, j) is computed as follows:

- Free float $(FF_{ij}) = (E_j - E_i) - t_{ij}$

Sharma, J. K. (2009). *Operations research theory and application.* MACMILAN Publishers.

So how much the preceding activity can be delayed? That delay should not affect the earliest starting time of our successor activities. So how much time we can delay our preceding activities? That amount is called free float. So the amount of free float time for non-critical activity say activity i to j is computed as by using this formula. So free float is earliest start time or finish time. So the difference in the earliest start time and earliest finish time minus your project duration.

Example 1: Scheduling a simple project

- Step 1: Create a new project
- Step 2: Enter a project start date
- Step 3: Enter the list of tasks
- Step 4: Enter task durations
- Step 5: Link tasks in the right sequence
- Step 6: Add a milestone to your schedule

So first I will explain how to, what are the steps that has to be followed. First you have to create a new project, then we have to enter the project start date, assume that the project is starting today, then we have to enter the list of stocks, then enter the task duration, then link task in the right sequence, then you can add the milestone on your schedule. So these are the steps that has to be followed for scheduling a simple project. Now we will see a demo of this problem. I will tell you what is the critical path and what is the earliest starting time, earliest finishing time, then what is the free float and what is the total float.
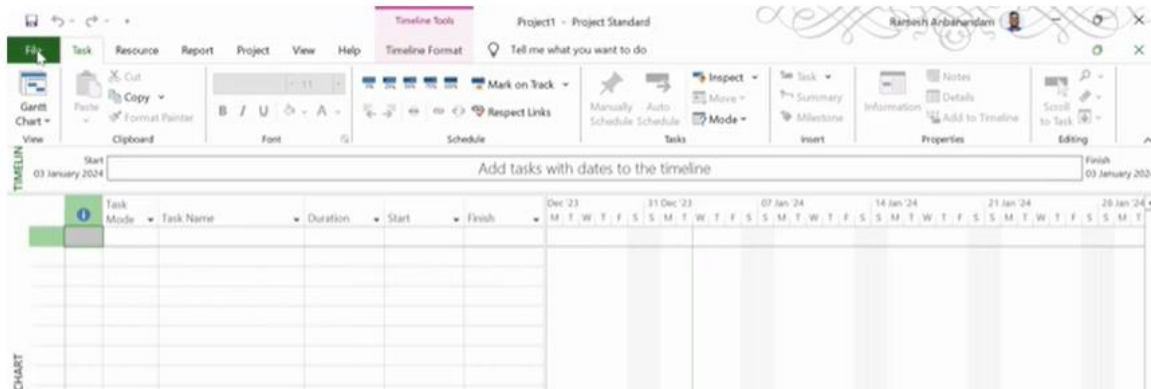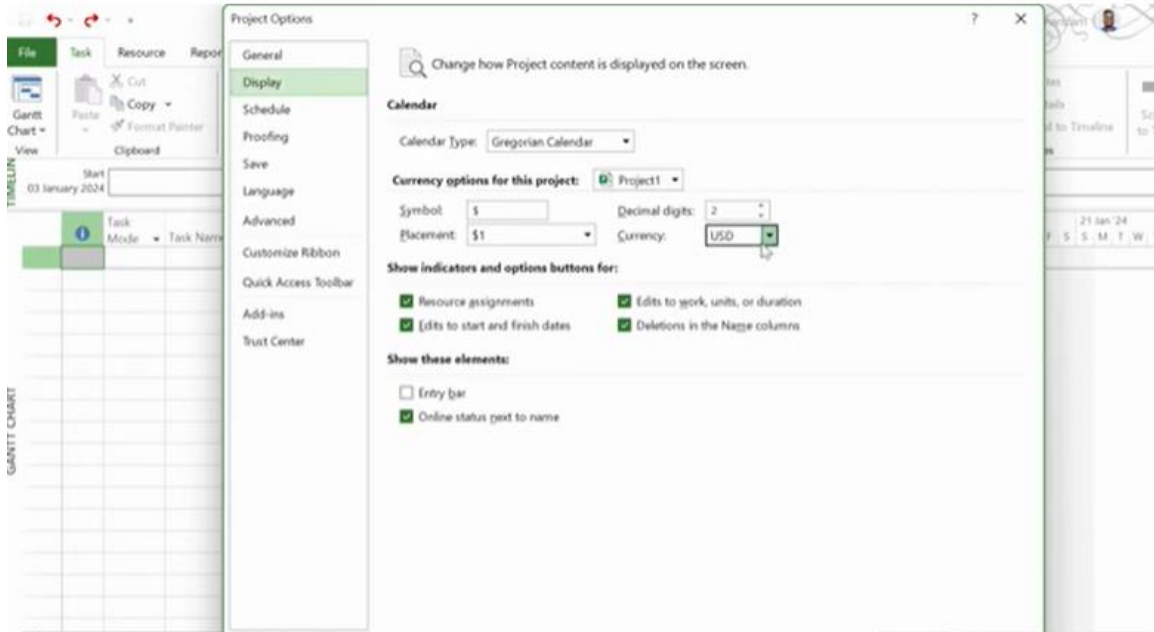
Now I have opened a blank project. As I told you the first thing is you have to go to file, then there is options. Here there are various options there. One is the date format, for example 20th January 2009, then display. Suppose if you want to display because US dollar is displayed, for example you can go to Indian rupees, then you can go to schedule.
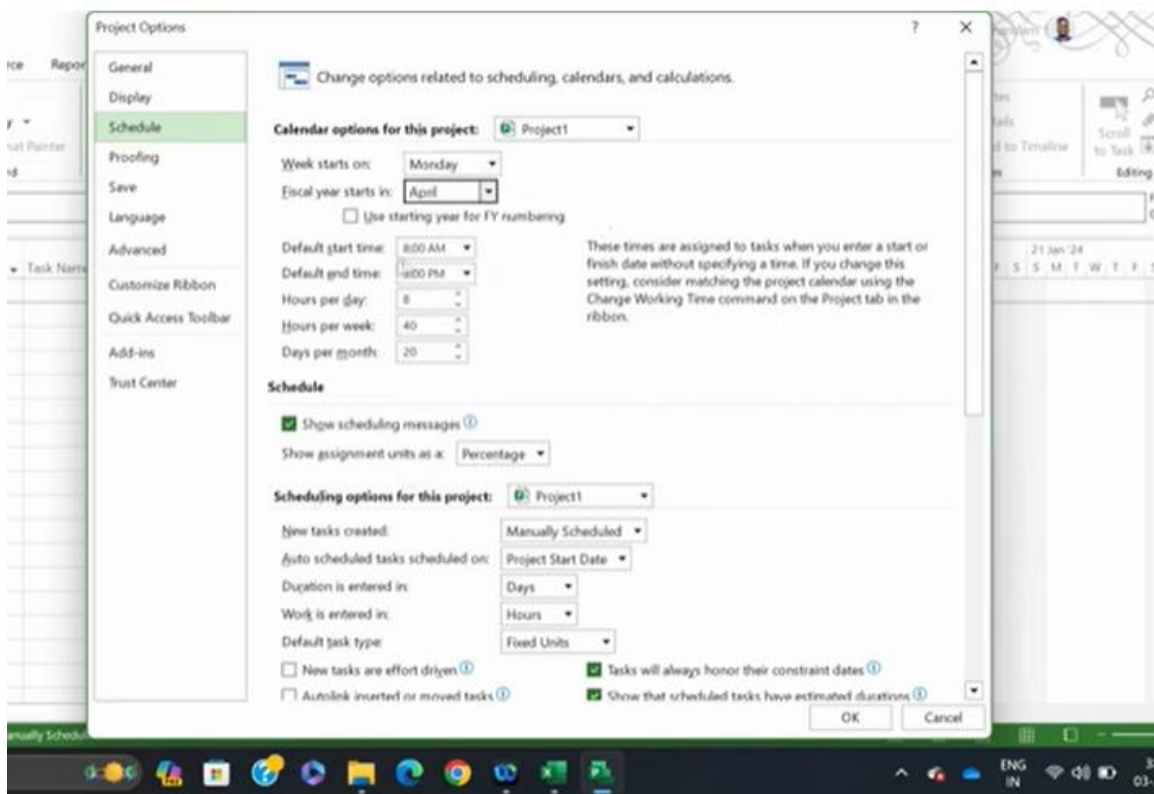

Here you see this is very important because default, because we use the standard calendar,

the week starts on, oh we keep it on Monday, then fiscal year, India it is April, then see the time starts at 8 am, finishes at 5 pm, hours per day 8, hours per week 40, days per month it is 20. Then you see calculate project after each edit, I put on, that is now in the latest version like immediate calculation. So this is the initial setting. After that, oh some more options there, go to files, then proofing, this is okay, then save language, yeah you can go to advanced one here. Here you can see, this is the default it is okay, there is no problem   in   this.
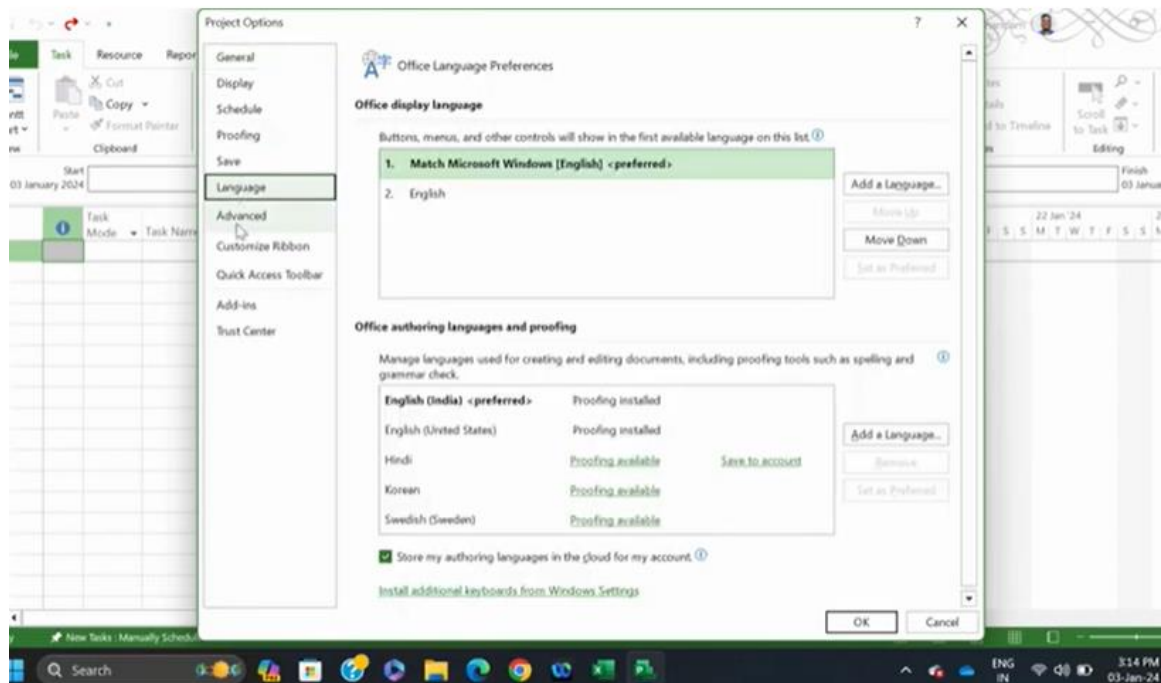
So press okay. Now when you open it, see one side is left side is the entry view, the right side it is going to be gone chart. See before that you go to project, there you have to click on project information, there you have to specify when the project is starting and what is the current date, then you see what kind of calendar you are using. I will come back to the calendar, there are three types of calendar is there, 24 hours, night shift and standard, we are following standard, then you can press okay. So after that again go to project, go to project, you can see change working time. See this is the customizing our calendar setting.
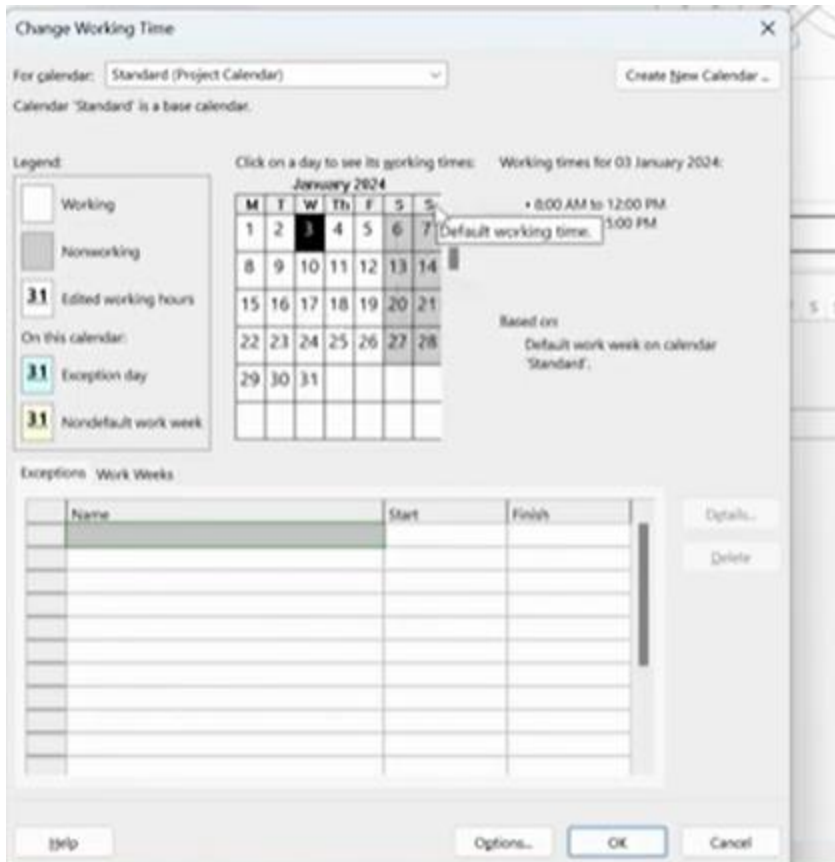
You see by default Saturday, Sunday is non-working day, other days are working day. You can specify any day for example 17th also you can specify as the non-working day. You can click it, you can write it, why it is not working day. So this is the way to configure the calendar, then you press okay. Now you see that there are various ribbon is there, one is a task is there, the task are many options are highlighted, then resource is there, you can assign resources, you can get the resource sheet, then you can get the reports, then you get the view.
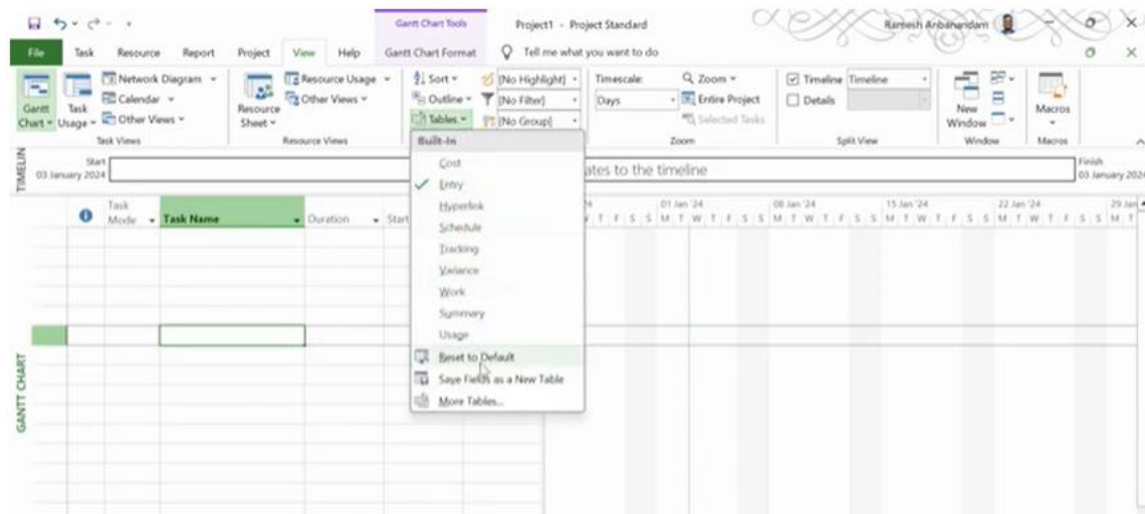
There are different views, you click on views, you see that there are when you click on tables, there are so many other options are coming that you can explore everything. So at present we will go for entering all the task name. So already I have entered, so I am going to copy this. There are 14 stock is there, I am copying, then I go to MS project, then I am pasting.


I have pasted this. The next one, duration, so duration I copied, all are in days, copy it, go back to the project, so duration I have copied here. By default days is there, as I told you, you can use it weeks also, you can month also. The next one you have to mention the predecessors. So I have copied this predecessors, then I am going to put on this side, here I am going to enter the predecessors. Copy, yes I have entered all the predecessors.
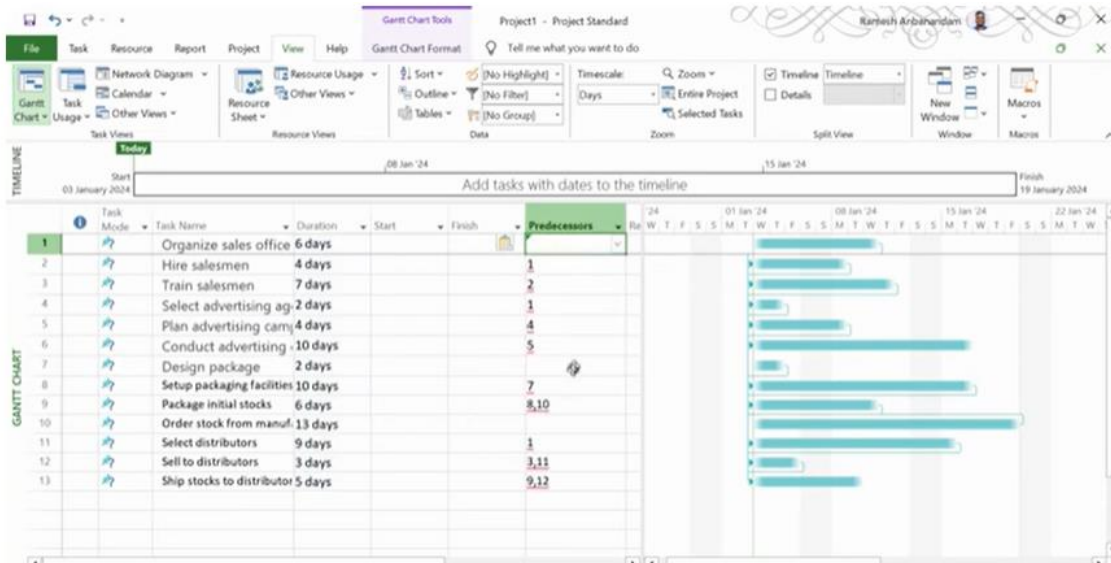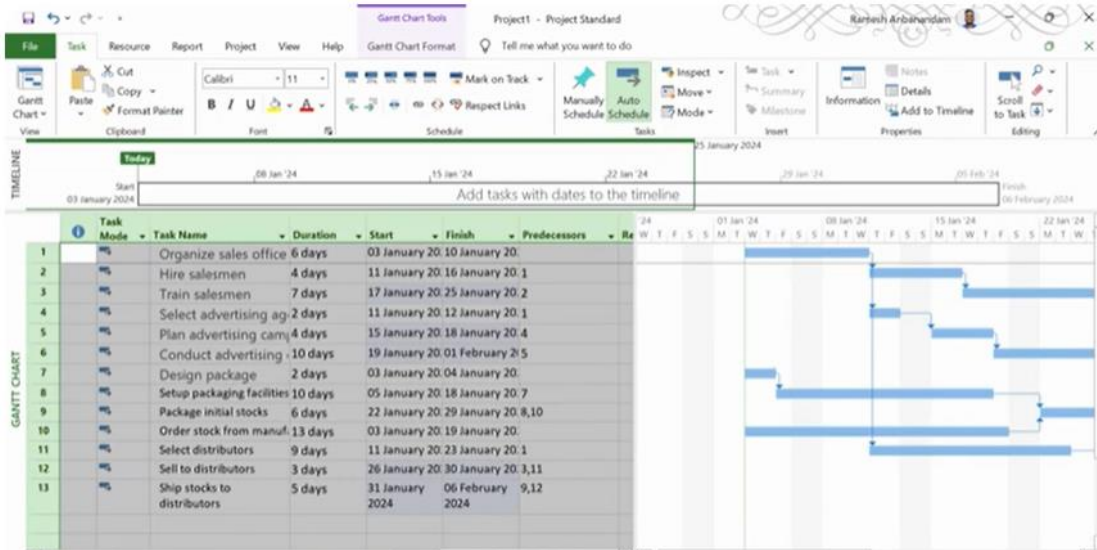
Now you see here it is a manual scheduling is there. So what you have to do, you have to select, if you see this is a diagonal box and you select it, all the whole project will be selected, then you go to task, then you go for auto schedule. So click it, auto schedule. So it is automatically scheduled. But you see at the bottom, if there are new task you are entering, that has to be manually scheduled, you have to be very careful.

So then this is the our project, then view, then you can see entire project. Now you can see whole projects. Suppose if you want to know the critical part of this activity, so what you can do, you can go to Gantt chart format. Yeah, this is Gantt chart performed. You click on critical task, see the critical task is highlighted.
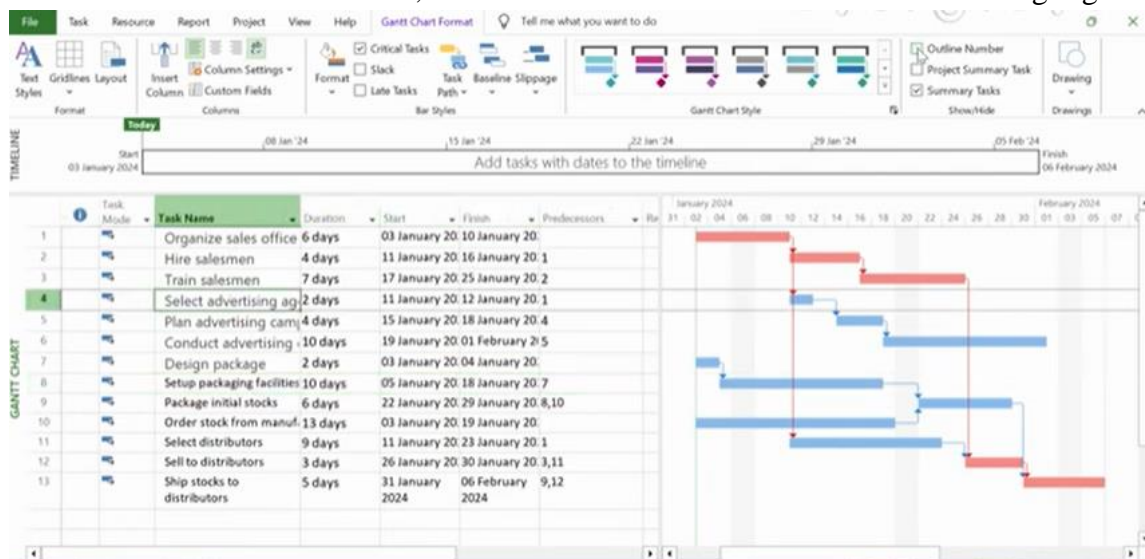
Suppose if you want to have the, if you want to highlight the numbers, so you select this one, so automatically number is given. So suppose if you want to insert, if you want to insert a new task, you say, I mean insert a new task, so this I am going to say start. So this also I am going to do auto scheduling task, auto schedule. So here for activity 2 that, see I

am given 0 days, because it is called milestone, it would not consume any resources. But I have to mention the precedence.
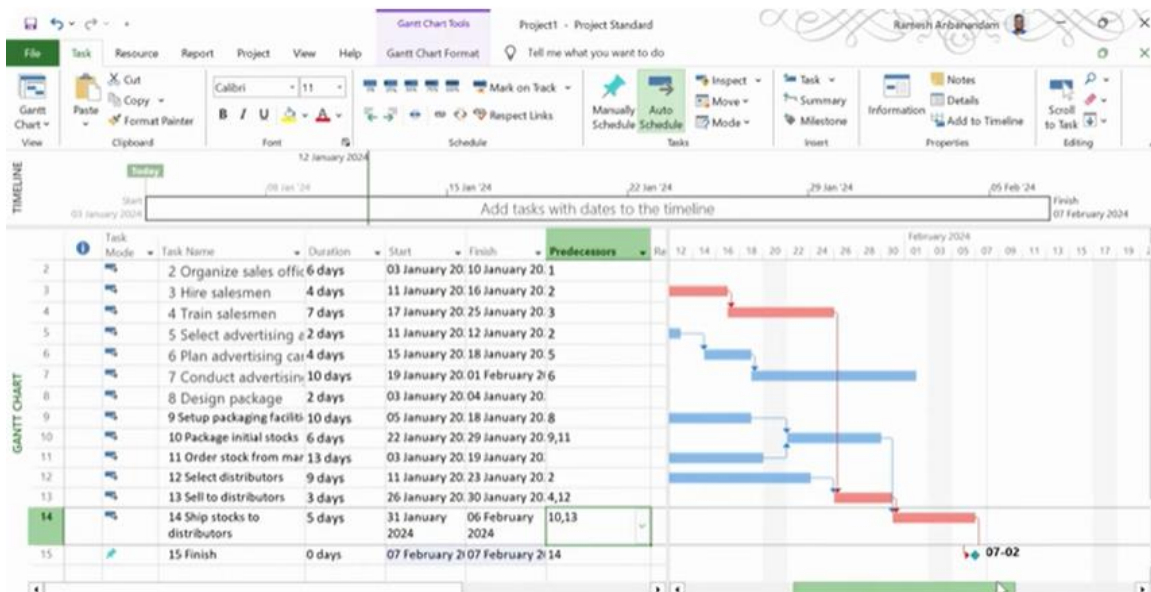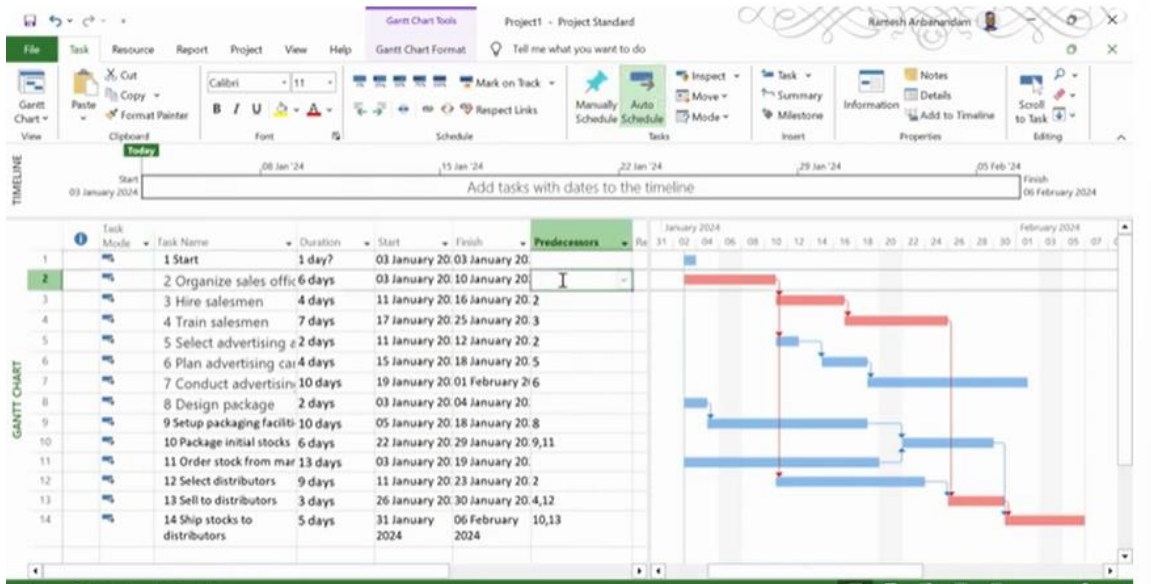

Now it is linked with this. Similarly, suppose I want to enter finish, F-I-N-I-S-H, it is 0 days, then the precedence is 14, see that at the bottom. So this diamond shapes says about the milestone. And what you can do, suppose if you want to enter the title of this project, so I am entering here, enter, insert a new task, say the task, I am writing project name. So the project name is new product, new product development. So this you can go for, so all other activities comes under new product development, so you select everything, then go for intent.

So this also you can give for auto scheduling. So when you do that, it says that it is a 25 days. So the MS project says that for completing all the activities, it will take 25 days.

You see that it is aligned 1, 1.1, 1.2, 1.3. If you want to further also you can have it, you can select this again further, put a intent so it will become sub activities of another work package. So this is a way to align the different sub task and work packages and we can have other more number of work packages also. So it says the project will take 25 days, the project will be started 3rd January, it will be finished on the 6th January.
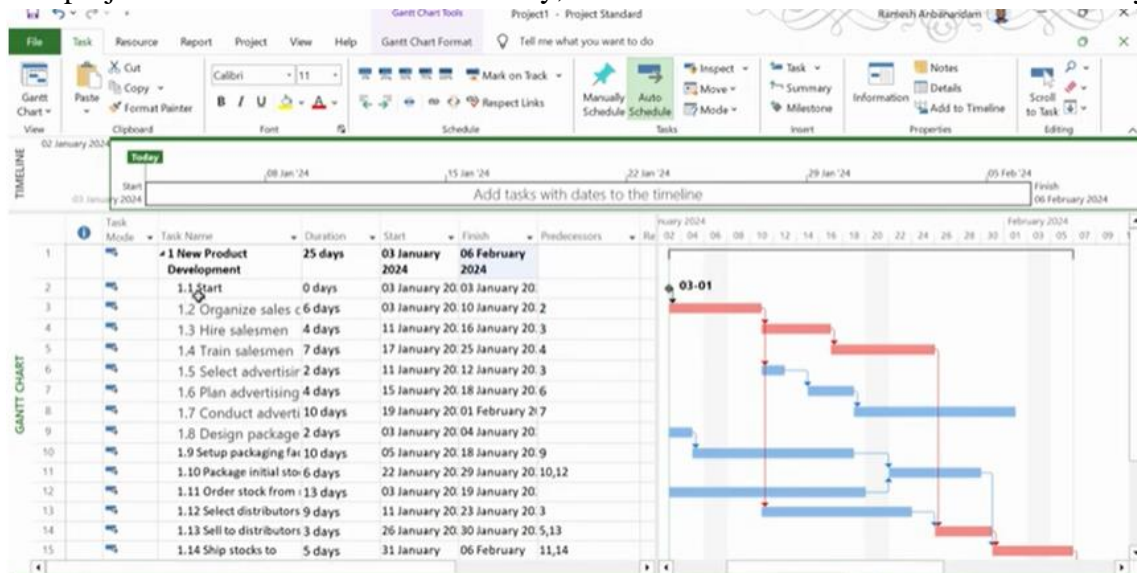

But Saturday, Sunday, you see that these are highlighted, so Saturday, Sundays are not working day. Then we have to see the earliest start time and earliest finish time and various critical activities. So for that purpose, so you right click on the extrement or you go to view, you see that the tables, so you click on schedule tables, it says that what is the starting time, finishing time, latest starting time, latest finish time and also it says the free slack, total slack. So next line, total slack is that many days your project can be delayed, free slack is out of the total flow that many days we can utilize so that it will not affect the earliest starting time of succeeding activity.
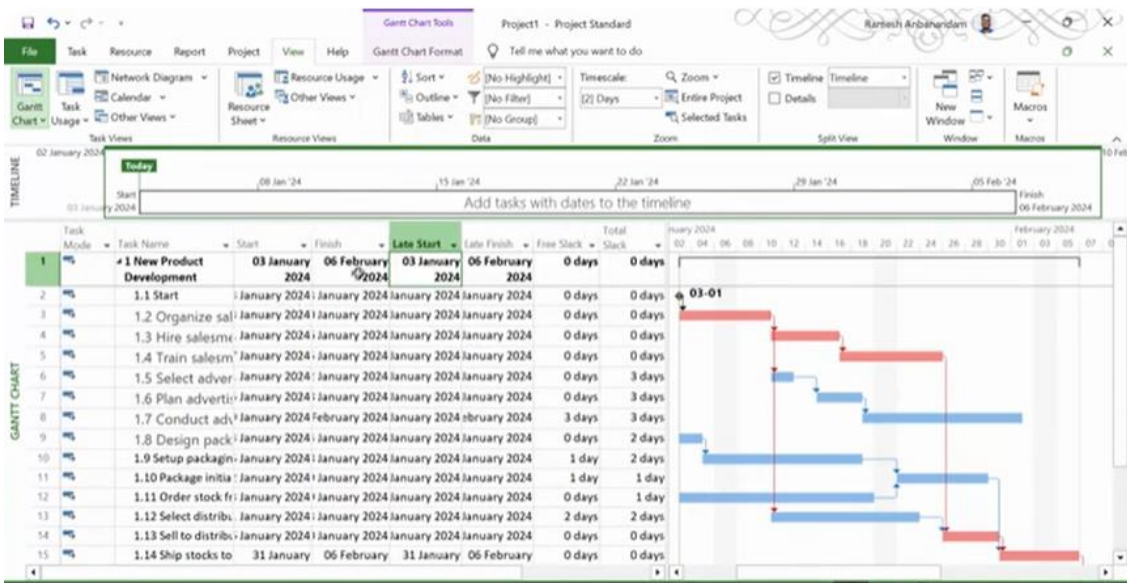
So that is the meaning of this free slack. And other thing, you can customize your columns. Suppose if I want to know all critical parts, suppose I have only the precedence, suppose if you want to all the successors, you can get all the successors. Or if you want to know the successor, suppose if you want to know the critical activities, so critical activities. So it is shown what are the activities are critical, what are the activities are not critical. Then we can see the network diagram of this problem.
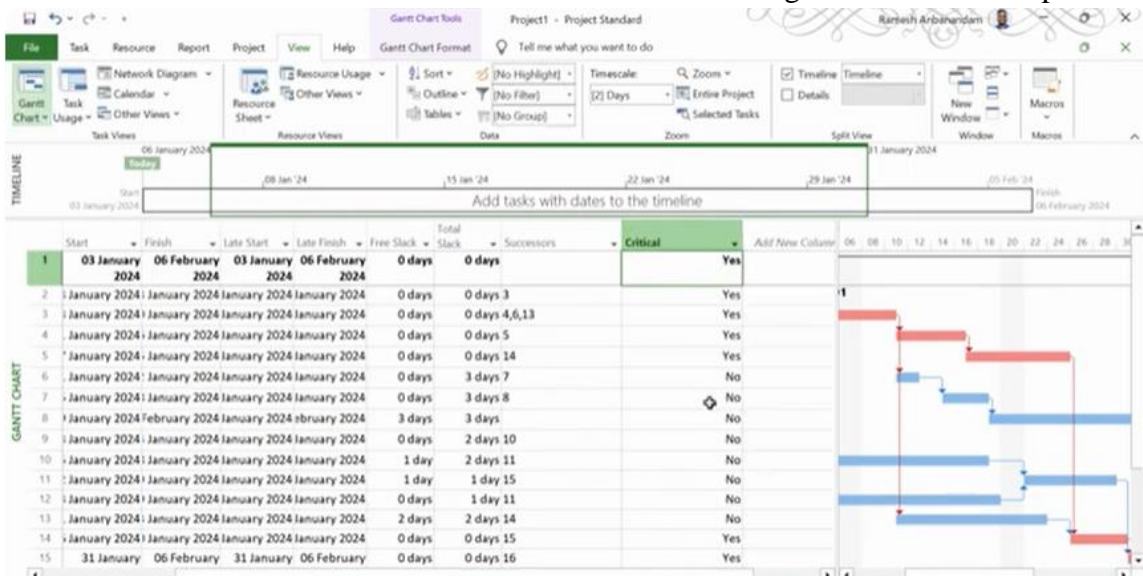
So go here, go here, go to task, go here, then you see network diagram. So now it shows view, yes, this is the whole project, zoom in, yes. So this pointed temple that says our milestone, start is the milestone. Similarly you see that at the end of the finish is another milestone. So the red color shows that these activities are critical activities.
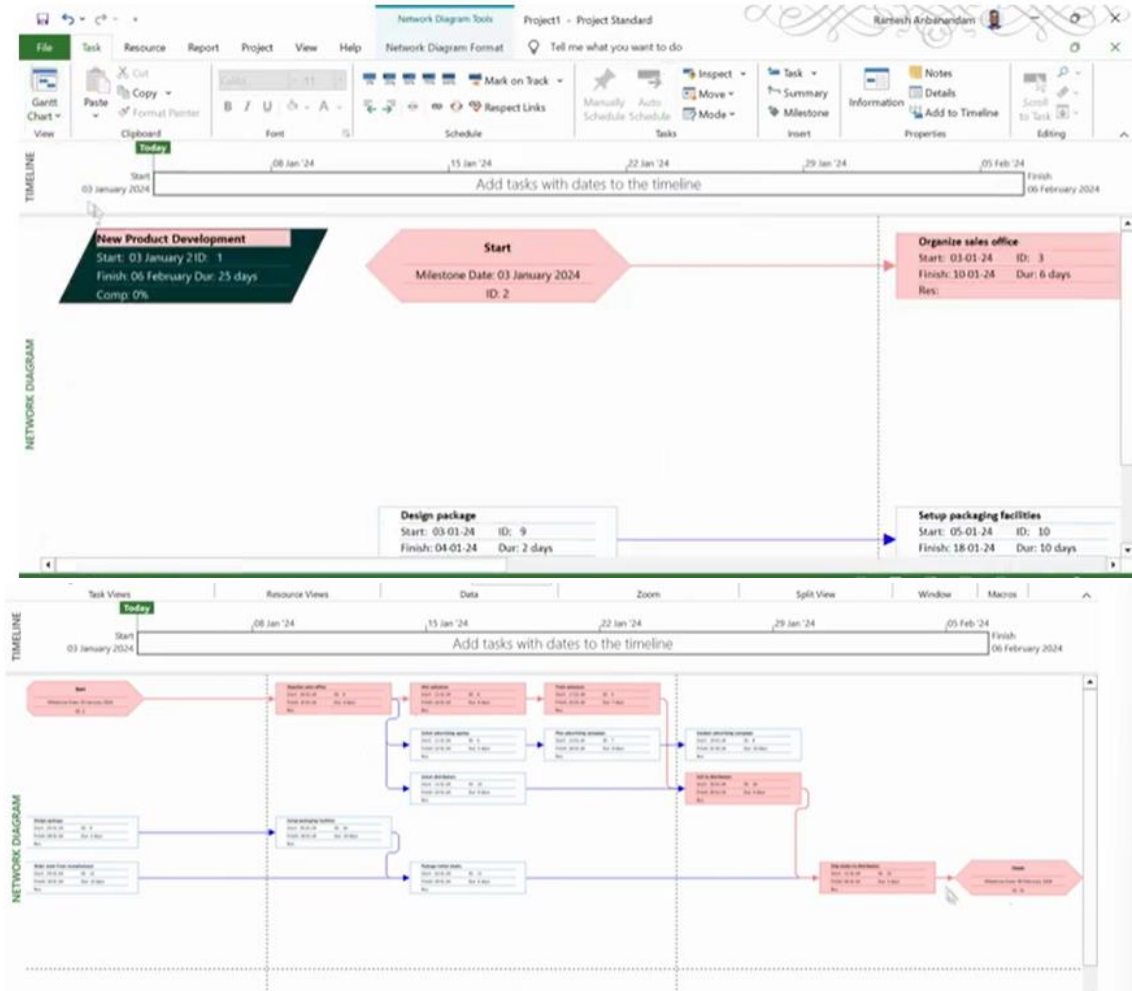
And other important things, all the activities are need to be connected, any activity cannot hang at all. So this is the purpose of your network diagram. So when you double click each box, it will open, it will give the whole details about each task. What are the predecessors, then what are the resources that I have not done yet, I will explain, then what are the nodes and all other things. So this is the way to do the scheduling with the help of MS Project software.

Example 2: Resource allocation

Task No	Task Name	Duration	Precedence
1	Project Approval	15 days	
2	Foundation	10 days	1
3	Building House	20days	2
		45 Days	

The second problem on this lecture is resource allocation. I have considered a construction project, that project has only three activities, project approval, foundation,

making foundation, then building the house. So there is a duration is given, say 15 days for getting project approval, then for making foundations it will take 10 days, then finally constructing the house it will take 20 days, the total duration is 45 days. So we say all the activities are taking place in linear. So the preceding activity for foundation is project approval.

Example 2: Resources

Task No	Resources Name	Type	Maximum	Standard rate	Over time rate	Cost/ use	Accrue	Calendar
1	Crane	Work	100%	$100/ hr	$120	$ 200	Prorated	Standard
2	Worker	Work	500%	$50/hr	$60		Prorated	standard
3	Concrete	Material	.	$200			prorated	
4	Money	cost					prorated	

So for the preceding activity for building house is the foundation. So what are the resources? First when you see, when you open the MS Project, you will get a resource sheet. So I am considering four resources, one is the crane, then worker, then the concrete and money. So in MS Project there are three type of resources we can allocate, one is work, then material, third one is a cost. So work is the 100% of that the crane available time is fully utilized here, that is the meaning of 100%.

Suppose I have five workers, each person have 100% utilization, so that means I have five manpower here and there is a standard rate for crane, so $100 per hour. Then if you go beyond our that eight hour duration, it will become over time, so it will be little higher than the hour standard time $120. Then cost per use, suppose when you bring that crane to the construction place, so you have to spend some another expenditure apart from this standard rate and over time, so that expenditure says $100 and another one is the accrue column says the way we are spending the money. There are three way to spend our money for this getting these resources. So sometime the start of an activity, sometime after finishing that activity, sometime prorated, prorated means based on the hourly rate.

Then that follow what calendar we are using, whether we are using our standard calendar or we are using the 24 hours calendar or we are using night shift calendar or we are using our customized calendar. So because this calendar based on the calendar only it will calculate the overall amount spent on crane. Suppose if you follow some other calendar, so the working days, non-working days may differ. So based on that working days the amount spent on crane will be calculated.

So choosing the correct calendar is more important. Similarly see worker, we have five workers, say per hour we are spending $50, if it is over time we are spending $60, so here also we will say only prorated, then we follow standard calendar. The next one is the

different, concrete. This type, resource type is called material. Here the percentage will not come, say per unit, here only the unit amount per unit of concrete say can spend $200, here also it is a prorated. Say money, cash, so that also cost, here it would not be standard rate, so whatever amount   we spend that has to be written, but this also prorated.

   Now this is the way to allocate money. First resource, the first resource says first you have to go to the Gantt chart view, say the project approval is there, I am right clicking, so I am allocating money. So what is happening is say $5000 I have allocated. So once you allocate it, then you can see in your cost table, you see for the project approval you see this is a $5000 is spent. The second resource is crane. So crane for example foundation we need crane, so I have only one crane because all 100% of its working time is utilized here, so I am putting 100%, so the amount spent is $8200.

Cost table after allocation of money

Task Name	Fixed Cost	Fixed Cost Accrual	Total Cost	Baseline	Variance	Actual	Remaining
1	▲ House	$0.00	Prorated	$5,000.00	$0.00	$5,000.00	$0.00	$5,000.00
2	Project Approval	$0.00	Prorated	$5,000.00	$0.00	$5,000.00	$0.00	$5,000.00
3	Foundation	$0.00	Prorated	-$0.00	$0.00	$0.00	$0.00	$0.00
4	Building House	$0.00	Prorated	$0.00	$0.00	$0.00	$0.00	$0.00

So you can right click, then you can assign the crane. For example foundation, we are using crane. Initially you see that initially it was 10 days. Now what has happened instead of 100%, I am using only 50% of that crane. So what happened, initially it was 10 days, now the number of days are increased. That is what I was saying initially, when you allocate the resources, the duration of the activity may be increased or decreased.

Allocation of crane 50 %

Here increasing because we are underutilizing, instead of 100% availability of the crane, we are using 50% of available time because that remaining 50% may be used for some other project. You see the option is popping up, so we change the duration but keep the amount of work same. So because since I selected this, the duration next slide say it has become 20 days. That is what the point here, change in allocation will affect the duration or number of hours that need to be worked.

Allocation

- Change in allocation will affect the duration or no. of hours that need to be worked

Over allocation

|	❶	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1			◢ House	45 days	Wed 03-01-24	Tue 05-03-24		
2			Project Approval	15 days	Wed 03-01-24	Tue 23-01-24		Money [$5,000.00]
3			Foundation	20 days	Wed 24-01-24	Tue 20-02-24	2	Crane [50%]
4	👤		Building House	10 days	Wed 21-02-24	Tue 05-03-24	3	Worker [600%]

For example building house, assume that we need workers for that. So we have only 5 workers because 500%. Suppose if you allocate 600%, instead of 5 workers, we are allocating 6 workers, so you will get a symbol, highlighted symbol here. This implies the over allocation. So how to resolve this over allocation? One thing we can reduce the manpower in that activity, otherwise we have to increase our available resources.

Overallocation in Resource sheet

|	❶	Resource Name	Type	Material	Initials	Group	Max.	Std. Rate	Ovt. Rate	Cost/Use	Accrue	Base Calendar	Code
1		Crane	Work		C		100%	$100.00/hr	$120.00/hr	$200.00	Prorated	Standard	
2	👤	Worker	Work		W		500%	$50.00/hr	$60.00/hr	$0.00	Prorated	Standard	
3		Concrete	Material		C			$200.00		$0.00	Prorated		
4		Money	Cost		M						Prorated		

So this is the way to handle the over allocation. And when there is a over allocation, you see that it is highlighted, say workers. See we have only 500 but I will show you in the demo because we have allocated 600% because of that this in the cost table, it shows in the red color. So this has to be handled. One thing is we can increase the manpower here, instead of 5 people you can have 6 people, then this will be managed. So finally what we can do? We can Microsoft project provide lot of reports, we can generate it.

Report- cost overview
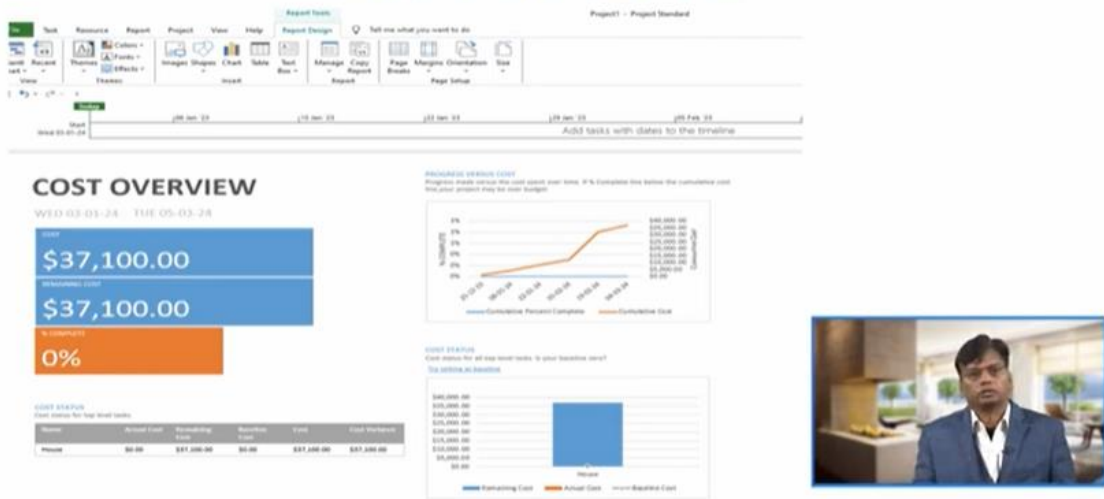
So in the, when you go in the report options, you can select the cost overview, so that will provide the details about the reports. Now we will go to MS project, I will explain the demo of how to do the resource allocation. I opened a new project, then I am going to type this is the building house, building house, this is my project name. Then assume that there are 3 activity in that is there, one is project approval, the next one is the foundation activity, then our building house. Now it is take, assume that it is taking 15 days, not 15 days, here project approval take 15 days, it is 10 days, it is 20 days.

Now I have to specify the precedence. So the one way if you see that when you go, when you click there is option link. You see when you press link, you select everything. You see that it automatically, see that it is automatically it is fixed with the precedence, otherwise we can enter manually also. Then we have to go to the, our project, then project information. So today I have given start date, finish date, then after that you have to go to working time.
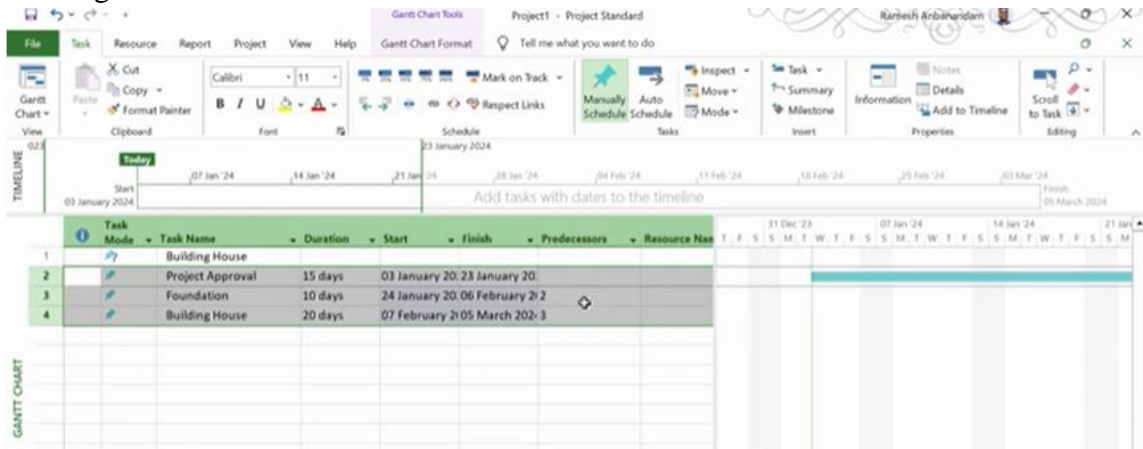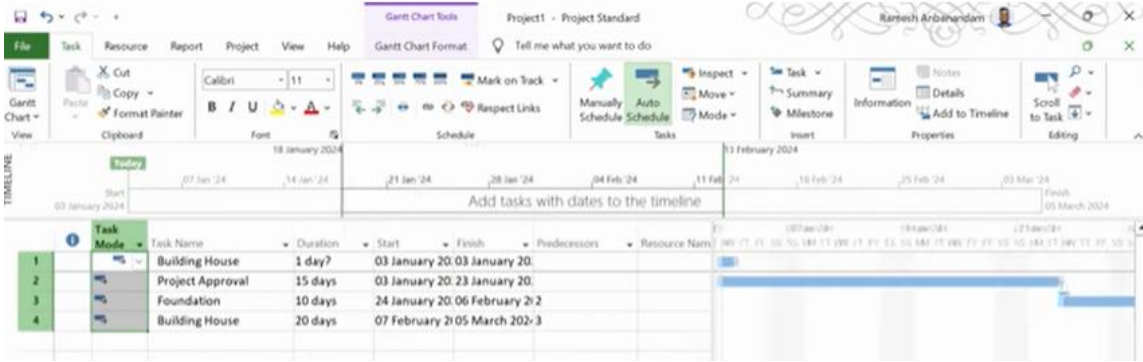
So you can default, Saturday, Sunday is non-working day, though week start from Monday to Friday. Then I have to do the auto schedule, so click this one, go to task, then I have, so it is auto task. And you see that the first one is my project name, so I have to select this, then I have to give the intenation. So now it is take, it is going to 45 days.

Now I am going to allocate resources. So I am going to consider some resources. So for entering the resource, what you have to do, you have to go to, see there is a resource sheet is there. When you open it, see first I have to type the resource name. So for example, I am writing crane. So what type, you see there are three type of resources, work, material, cost.
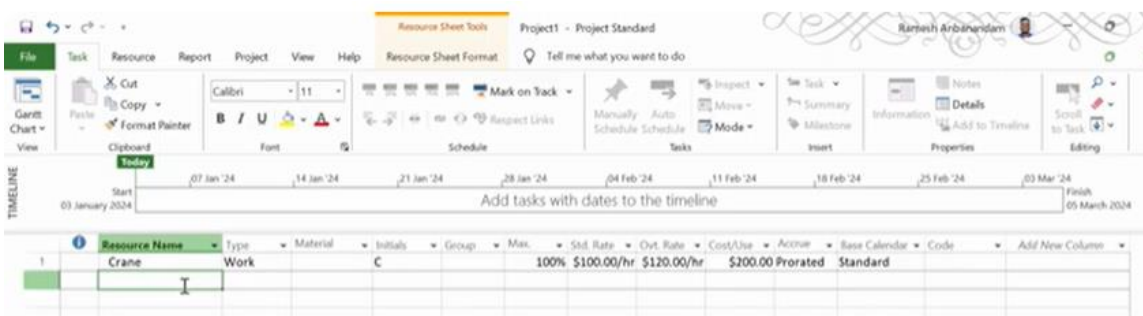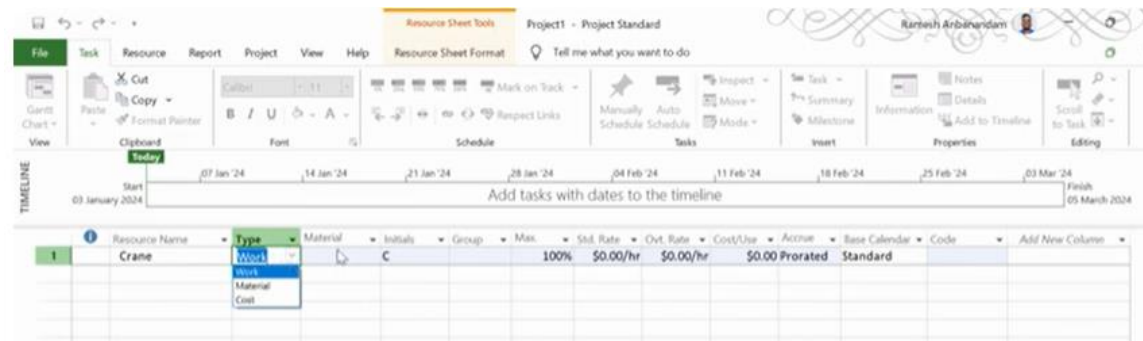
So this is work. Then see that the crane all 100% of available time of crane I am going to use, so it is called 100%. Then we can give the rate, say I am spending say 100 dollar per hour. Then I can give the overtime, say overtime is say 120 dollar. Then cost per use, as I explained when you bring a crane to the construction place, you have to spend another additional some cost, so say this is 200 dollar. Then you see that this is the way of spending

our money, whether as soon as I get the crane, I have to pay the money at the starting of the activity or at the end of the activity or as per hour.

So I am using pro-rated as per hour. So here you have to choose calendar, that is more important because based on the calendar only the total cost will be calculated, whether you are using 24 hours calendar, night shift, so we follow standard one. The next resource is a worker, yes I have to do the foundation for that purpose I need the manpower, so worker, so this also work. And you see assume that each worker have 100%, so at present I am having 5 workers, so I kept say 500%. So I am paying 50 dollar per hour and if it is any additional cost I am paying say 60 dollar per hour.
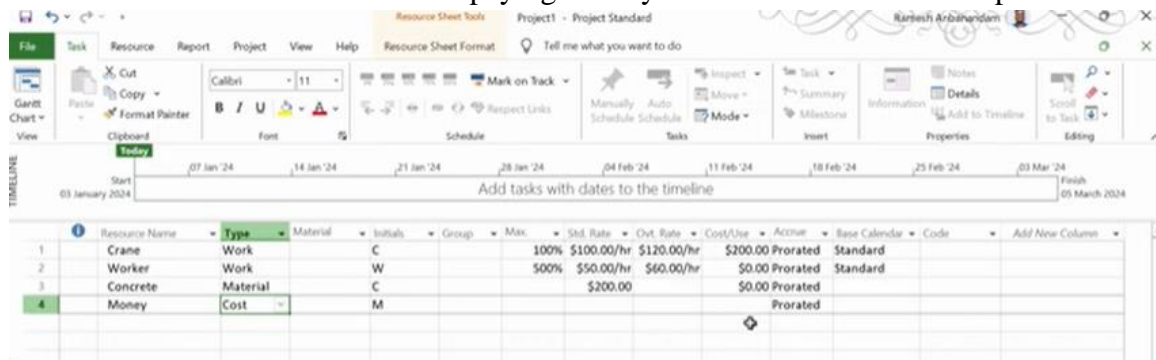

The next resource is a concrete because I have to make a foundation. See here I am selecting concrete as a material. So when you make material that the maximum percentage there is no meaning, but how much you are spending per unit say 200 dollar you can type it. The another resource is the say money is very important, money. So here I am going to say it is a cost, is neither material not work cost. So here only pro-rated as much whenever I can pay the money on the hand to the our workers.

So now what I have done, now I have created the pool of resources which are available with me. Now I have to assign these resources to the activities. So for that purpose again you go to Gantt chart view, there are different way. So first you select project approval, you right click, there is option for assign resources.
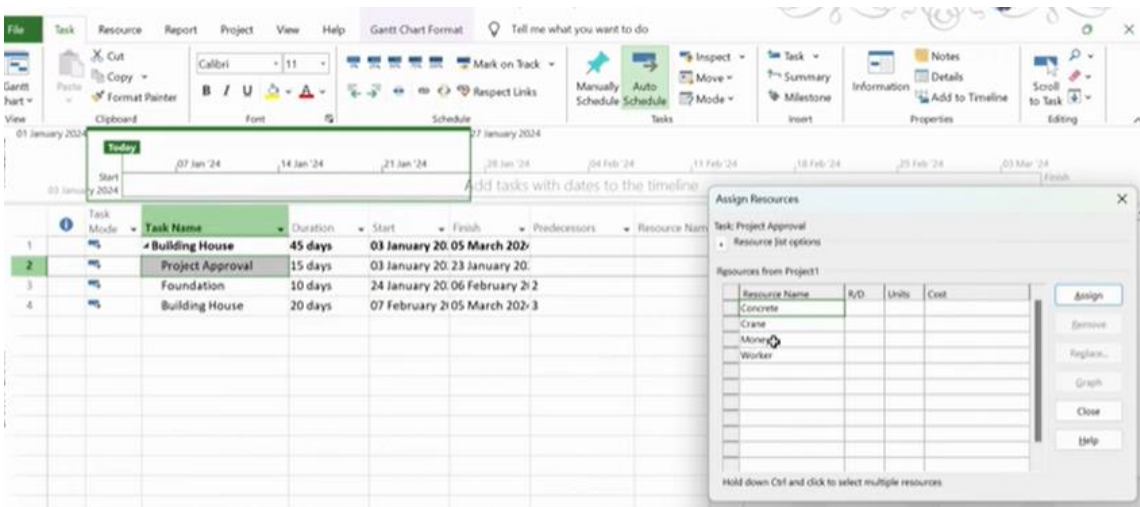
So this box is opened. So for building approval, so I have to pay money, you select, you can select money, then you have to enter how much say I am spending say 5000 dollar, then assign it. So money is assigned. The next resource is you can add multiple resources also to the same activity. So after I allocate the money then you can see the how it is, you can see the effect of this cost table. So you go to right click here, you see cost table, it shows   see   that   I   have   spent   5000   dollar.
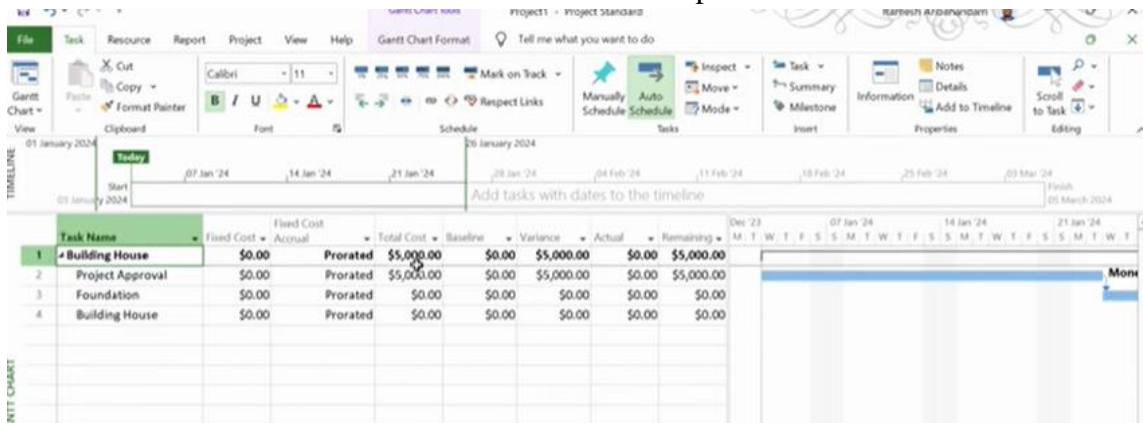
So as soon as you allocated you can see how it is reflected on the cost table. So now we will go back to the other resources. So project approval is spent say foundation. So foundation, so for the purpose of foundation I need a crane, so right click assign resources.

So I need crane. So crane I am going to use say 100 percentage. So I have assigned it 100 percentage. Now what will happen? Suppose it is a 100 percentage I am using only 50 percentage available time. So go to Gantt chart. Now see the foundation currently it is taking   10   days.
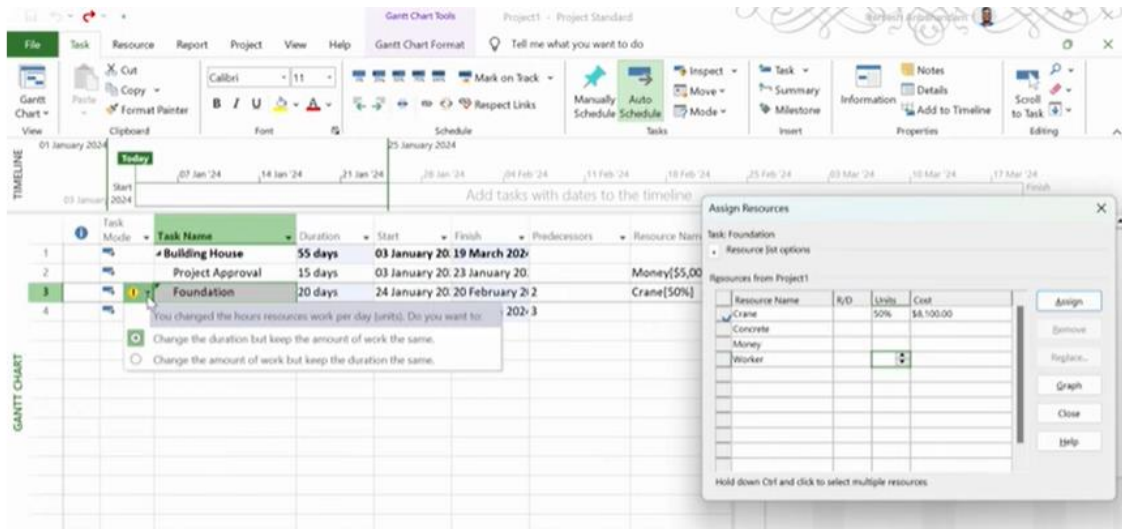
So what I do, I am going to assign only 50 percentage of available crane. So right click, assign resources. So I am going to change this. Instead of 100 percentage I am going to allocate only 50 percentage. So now what happened, see initially it was 10 days but the foundation days has increased. But now you see there are top of, there is one pop up window appears, it says change the duration but keep the amount of work the same.

So what happened, I have agreed for that. So the duration has increased because we have used lesser resources. That is one thing. Now what will happen when you allocate some resources, so that will affect the duration of the project or we have to work more number of hours to complete that. So now the next resource I am going to allocate is building house.

So building house, right click, assign resources. So I need worker. Assume that initially I have explained I have only 5 manpower. So deliberately I am going to allocate 600. So when you assign it, you see that that i column, there is a red color is there.
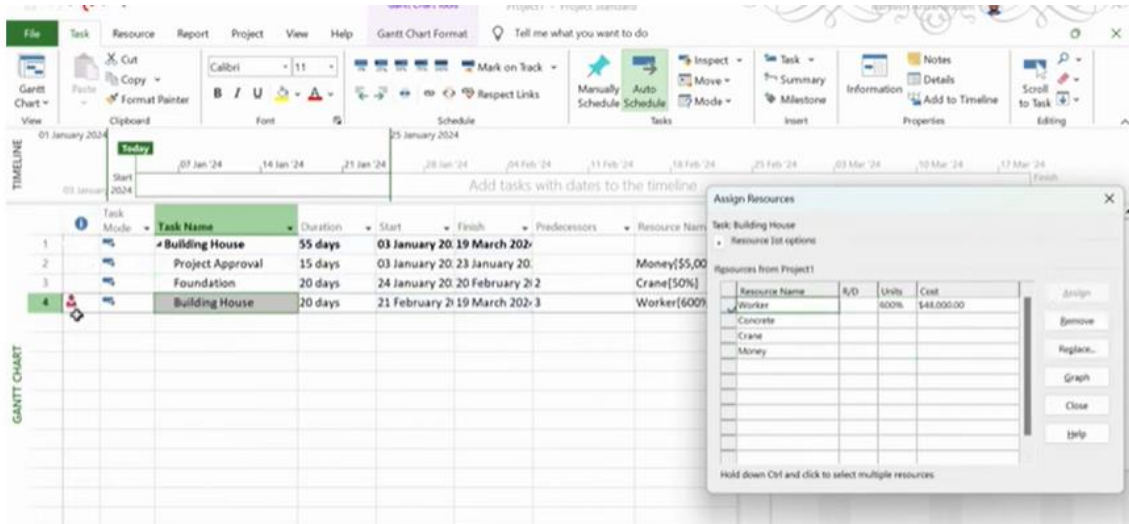
So it implies that there is over allocation of the resources. You close it. Now it says that there is a over allocation of resources. When you go to resource sheet table, you can go to resource, resource sheet. You see that it is highlighted because we have only 5 manpower but we allocated 6 manpower to activity. So one way you can increase this manpower 5 to 6, then this over allocation can be managed.

Otherwise instead of 6 manpower, you have to allocate only 5 manpower. So this is the way to allocate the resources. Now the other important thing is after allocating the resources, you can see various reports.

You click on the report options. So go to dashboard. So you can see the cost overview. See that it says that the cost overview. So we can get various very useful reports from the MS project. So this is the way to allocate the resources for an activity for a whole project. Dear students, in this lecture, I have explained how to do some basic configuration before you start MS project.

I have taken two problems. One is scheduling in a simple project. The second one is resource allocation. In the scheduling a simple project, I have explained how to do the initial setting, how to mention the precedence relationship, how to find out the total float,

then free float. Then also I have shown in the Gantt chart what are the critical part. The second problem, I have explained how to allocate the resources. So I have explained the type of resources like I have considered money is one resource, crane is another resource, manpower   is   another   resource.

  So what will happen when you allocate the resources to the activity? The duration of the activity may increase or decrease. After that I have explained what is the meaning of over allocation. So when you allocate more than its capacity of available resources, suppose I have   only   5 manpower but I have allocated 6 manpower to activity.

  So that is called over allocation. So I have explained how to handle that. Finally I have shown you how to generate various reports with the help of MS project. Thank you. Thank you.