Computer Integrated Manufacturing
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Lecture 02
Introduction to CIM

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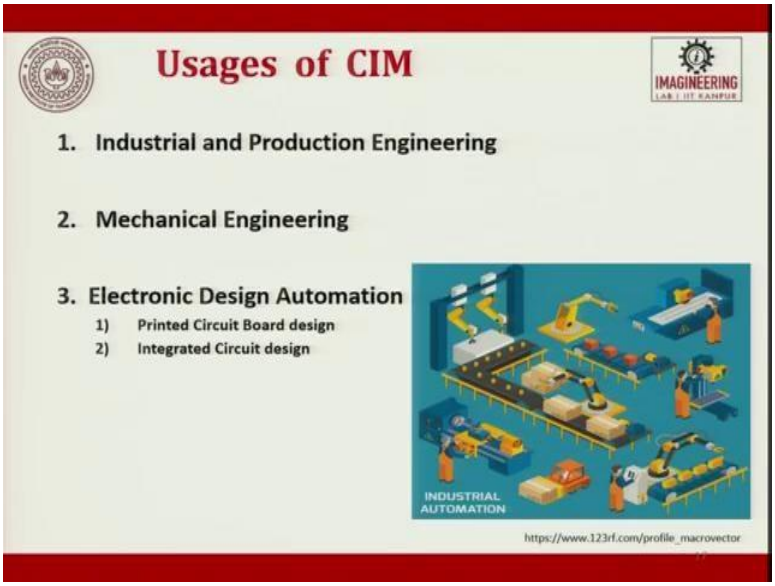

So, the next is where all are the usage of CIM? So, CIM can be used in industrial and production engineering, it can be used in mechanical engineering, it can be used in electronic design automation, PCB design and integrated circuit design. So, these are all the places were CIM can be exhaustively used.

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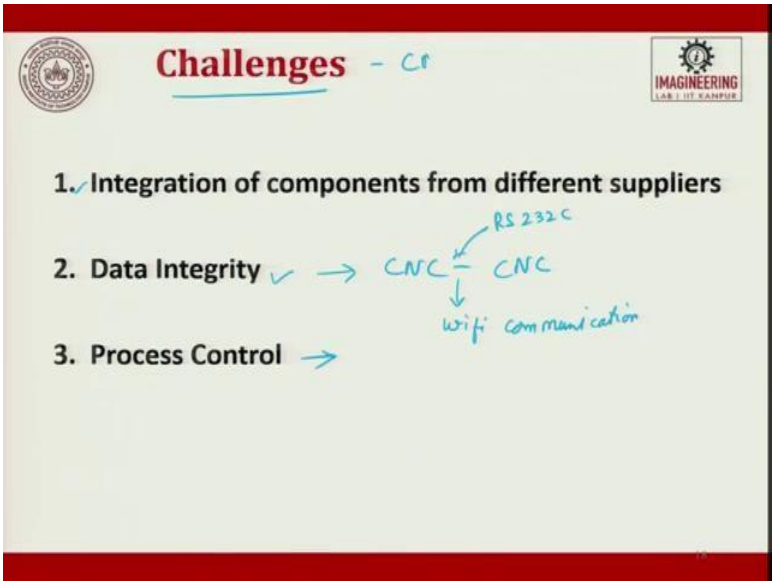

What are all the major challenges while implementing CIM? Integration of components from different suppliers is a major challenge. Today, there are only two three operating systems Windows operating system, Linux operating system you have open source, so there are only three four players across the globe. So, any software you buy and then you load it on your desktop or your laptop or your palm top, you are able to get the base thing run.

But in industry, when there are a lot of hardware is getting developed, almost all these hardware do not have a standard platform. So, integrating this is a big challenge and people who have invested huge money for developing a hardware they will never be ready to accept to generalize or to unify their operating system. The data integration is a big challenge.

So, even today, if a CNC machine wants to talk to another CNC machine, we seldom use Wi Fi communication because there is a huge set of data, we always go look at RS 232 C for communication. This is because the data has to be has to have integrity when it gets transferred, and there cannot be any signal to noise ratio error or a error getting introduced. And the last one is process control. So these are the challenges which are been faced while implementing CIM environment.

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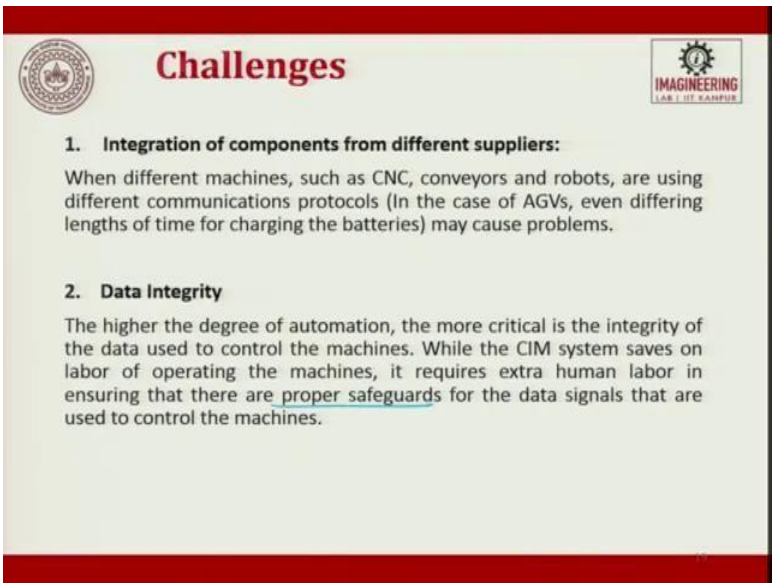

So, the integration of components from different suppliers when different machines such as CNC, conveyers, robos are using different communication protocols, this might cost a lot of problem for integration. Next, data integrity the higher the degree of automation more critical is the integrity of the data used to control the machines. While the CIM system saves on labor of operating the machine, it requires extra human labor in ensuring that there are proper

safeguards for the data signal that are used to control the machine. So, data integration at a higher level of degree automation is very very important.

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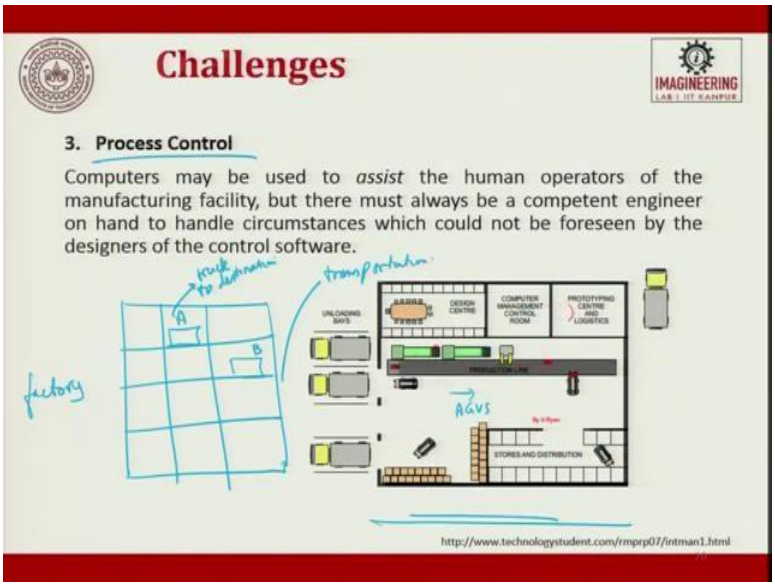

Process Control is another thing which we are very much talking today. Computers may be used to assist the human operator of the manufacturing facility, but there must always be a competent engineer on hand to handle circumstances which could not be foreseen by the designer of the control software. So, you look at this environment, this is completely CIMs, you can see here truck moving. So, what you can see the signal getting transferred from the computer controlled room. So, it is conveyed to the, these are nothing but the AGVs. So, these AGVs are they are going to pick they will try to take and then or it is the platform where it is loaded with completed products. So, these AGVs pulled them, and then they go loaded in a truck. I once when I was visiting a company in Japan, it was pretty interesting they had something like three dimensional storage of manufactured goods, and it is a soap company. So, what they do is they have a three dimensional array, and this side is a factory, and the other side is the transportation, transportation means there are vehicles there. So, when as soon as a factory they may they fabricate a box, a carton box of soap, it exactly places in the location where each location in turn is identified to be taken by truck to a destination. For example, all these things loaded in A might go to a location called D all these things which is loaded in B will go. So the trucks know, where to go the conveyor knows how to pick, So, the entire process is getting controlled. Computers may be used to assist the human operators of the manufacturing facilities, but there must always be a competent engineer on hand to handle the

circumstances which could not be foreseen. So, here is a typical CIM environment for your understanding.

So, you can see storage and distribution, you can see this is moving to the trucks and here computer control, management control it is given. So, then it is moved to the production line and then they start producing it. So, this can be taking from the raw material and producing it.
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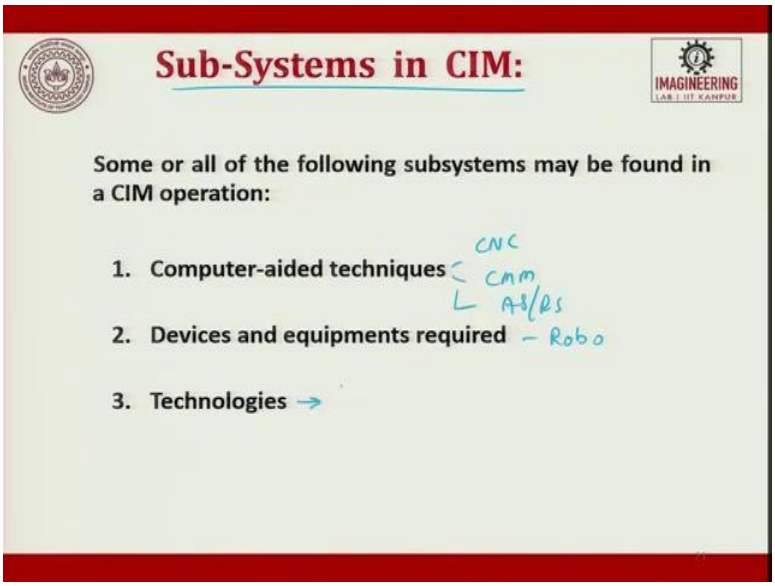

So, what are the subsystems in CIM? So, some of the subsystems. Some or all of the following subsystems may be found in CIM operation, computer aided techniques, CNC machines CMM, ASRS etc. Devices and equipments required this can be a robo, and technologies. These are the subsystems in CIM environment.

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So, when I talk about CIM as an umbrella, so we have CAD Computer Aided Design. This is in this umbrella next computer, Computer Aided Manufacturing this is the next thing, CAM. The third thing, Flexible Manufacturing System. So, that also falls under CIM, FMS. Then you have Computer Aided Process Planning, which is nothing but CAPP. The next one is Computer Aided Engineering wherein which we do analysis CAD, CAM everything put together is called as CAE. Then next is Computer Aided Quality Control Assurance. So, this is called a CAQ. So, here they are trying to measure the data, store the data, retrieve the data and also try to have statistical planning and other things. So, the next one is Production, Planning and Control. So, this is also part of CIM PPC and the last one is Enterprise Resource Planning which is nothing but ERP. ERP is also part of CIMs environment.

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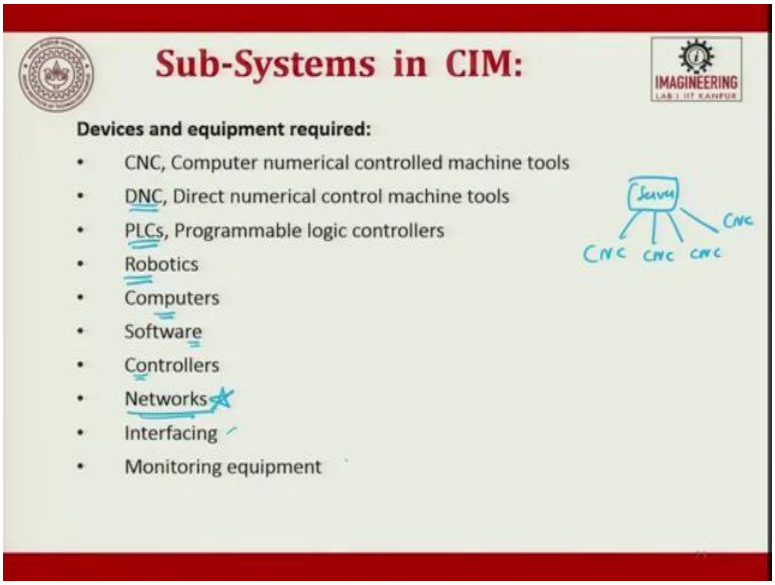

So, the devices and the equipment's required, CNC, DNC. DNC is direct numerical control that means to say you have a server and then you have several CNC machines coming into existence. So, if the space shortage is there for the program, then every time it goes to the server tries to pull it and this server directly controls the CNC machines. You have PLCs program logic controls, this is a device and equipment, robotics, computer, software, controller, networking. This is very very important, communicating between two hardware systems, interfacing and monitoring equipments.

So, these are the subsystems in part of CIMs environment.

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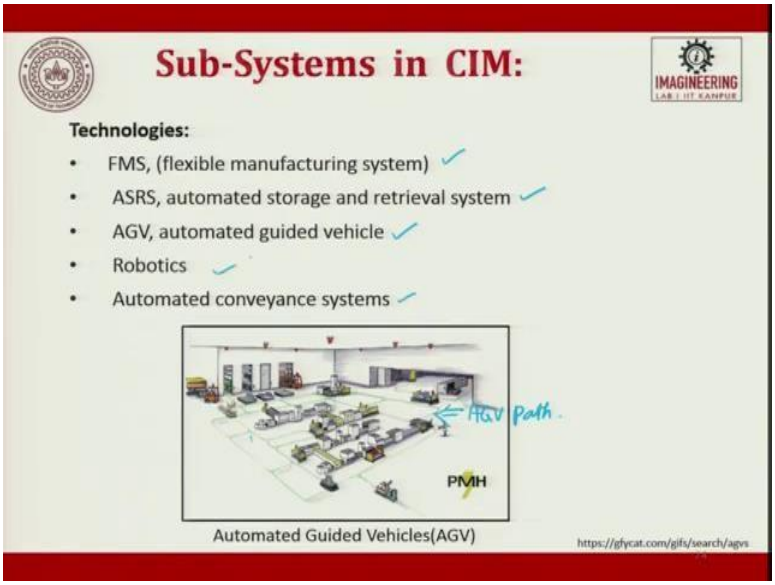

The technologies which are used under CIMs are going to be FMS, ASRS. ASRS is nothing but automatic storage and retrieval system, then you will have AGVs. AGVs are automatic guided vehicle, these are AGVs what is moving here. This is an AGV then you also have robots which keeps moving. So, this is AGV path and you have robots, you have CNC machines and you also have automated conveyer systems.

So, all these things are the technologies of CIMs. So, they are all the subsystem of CIMs.

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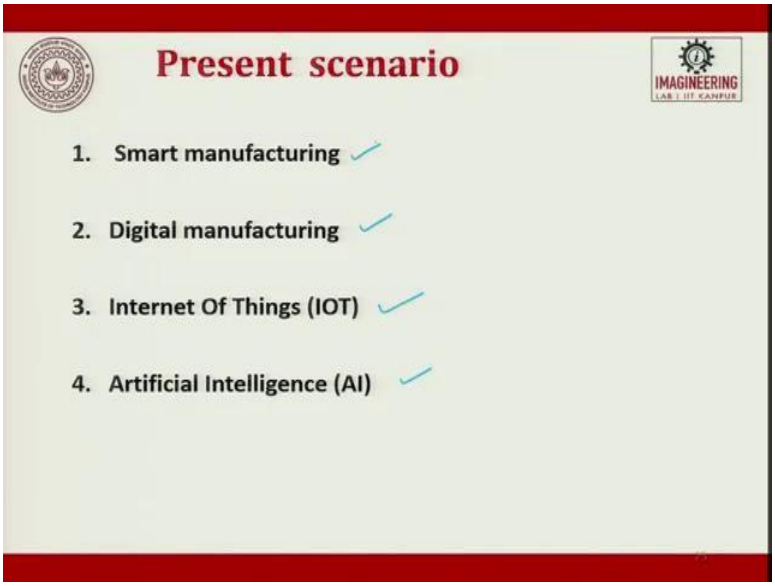

So, the present scenario what we are talking about in today's manufacturing. Smart manufacturing, digital manufacturing, IOT and artificial intelligence. Smart manufacturing is how with minimum data, how do we get the maximum productivity? Smart is, how do we

integrate the factory with minimum data, try to get the best out of it, try to do a prediction and then do it digital manufacturing as you know every drawing is converted into a digital.

Every CNC machine uses a digital, every ASRS uses digital information. So communication becomes very easy, so digital manufacturing is the next. IOT is nothing but Internet of Things. So in Internet of Things, you are now trying to talk about sensor, sensor and the level of networking and the applications of networking. So, artificial intelligence is the latest one which people are working on.

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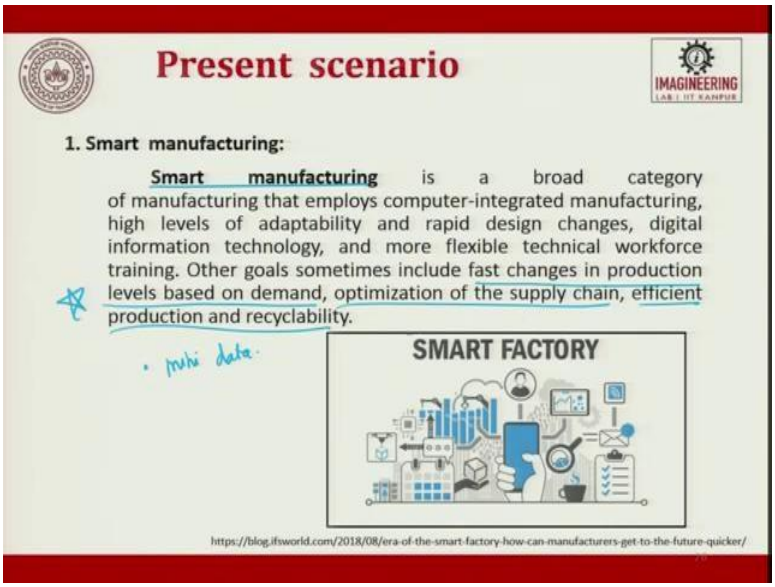

Smart manufacturing is a broad category of manufacturing that employs computer integrated manufacturing, high level of adaptability and rapid design change, digital information technology and more flexible technical workforce training. Other goals sometimes induce fast change in production levels based on demands optimization of supply chain, efficient production and recyclability. So on top of it with minimum data, this is also the other important thing. So, these are very very important for smart manufacturing, fastly changing in production level based on demand, optimization of supply chain, efficient production and recyclability. These are all part of smart manufacturing.

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When we talk about digital manufacturing, it is the use of an integrated computer based system comprised of simulation, 3D visualization, analytics, and collaboration tools to create products and manufacturing process definitions simultaneously. Digital manufacturing evolved from manufacturing initiatives such as design for manufacturability, computer aided manufacturing, flexible manufacturing, lean manufacturing that highlights the need for collaborative products and process design.

So, what is lean manufacturing? With very minimum input, input in the sense inventory that is called as lean manufacturing. And so, these two definitions are very important as far as digital manufacturing is concerned.

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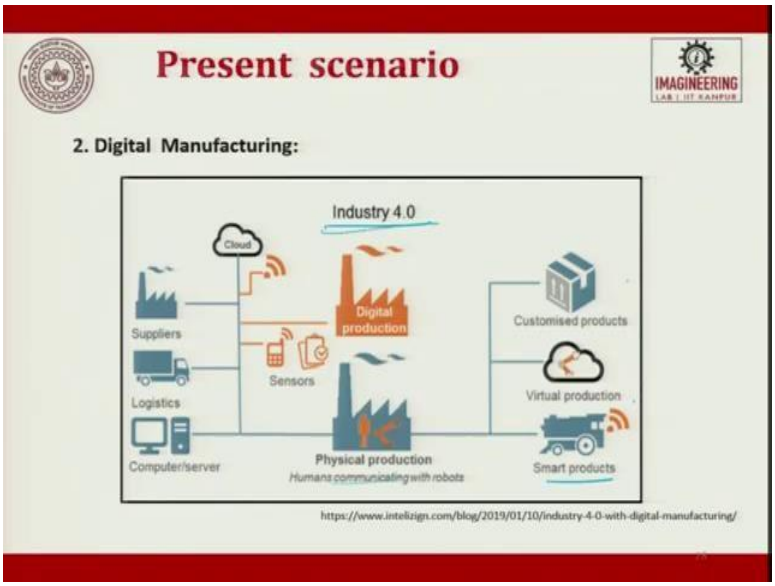

This is digital manufacturing, industry 4 point 0 is part of digital manufacturing, you have a supplier, logistics, computer all these data is held in cloud and then you have sensors, digital production happens here, physical production happens, customization, virtual and smart products, all these things are done inducing industry 4 point 0 which is nothing but part of digital manufacturing.

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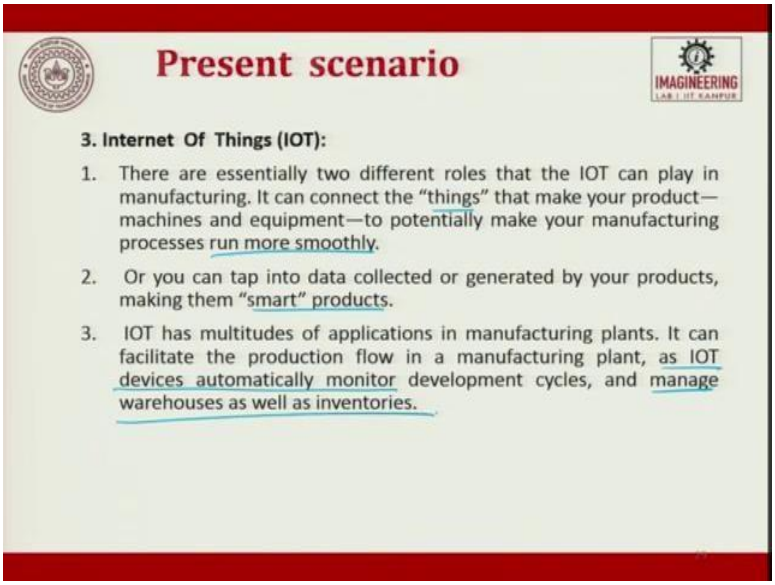

IOT, which is very much talked about. There are essentially two different roles that the IOT can play in manufacturing. It can connect the things that make your product, machine and equipment to potentially make your manufacturing process run more smoothly. So, it can connect the things that make your product machines, equipments to potentially make your manufacturing process run more smoothly, we use IOT or you can tap into data collection generated by your products using them smart products. IOT has multitudes of application in manufacturing plant, it can be facilitated the production flow in manufacturing plant as IOT device automatically monitor development cycles and manufacture and manage warehouses as much as inventory.

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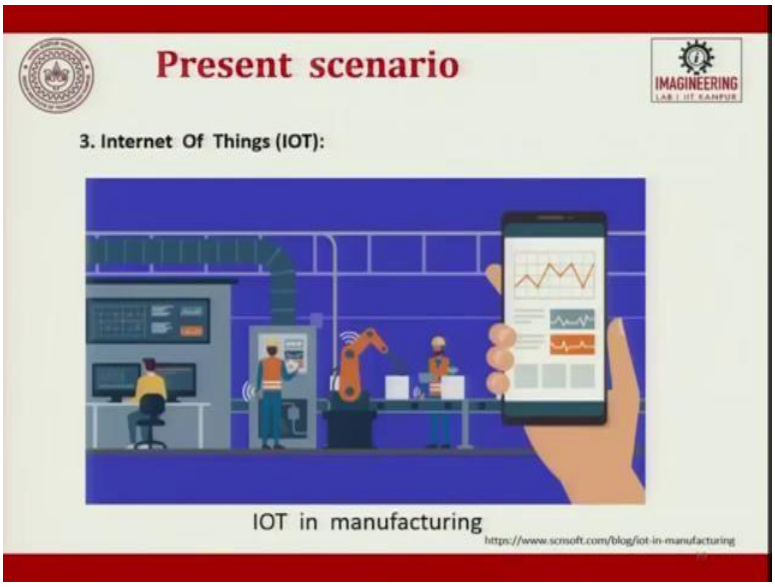

So this is IOT. IOT is nothing but you have machine, machine talking to the robo, robo talking to assembly line, assembly then you are able to visualize and see through a smartphone.

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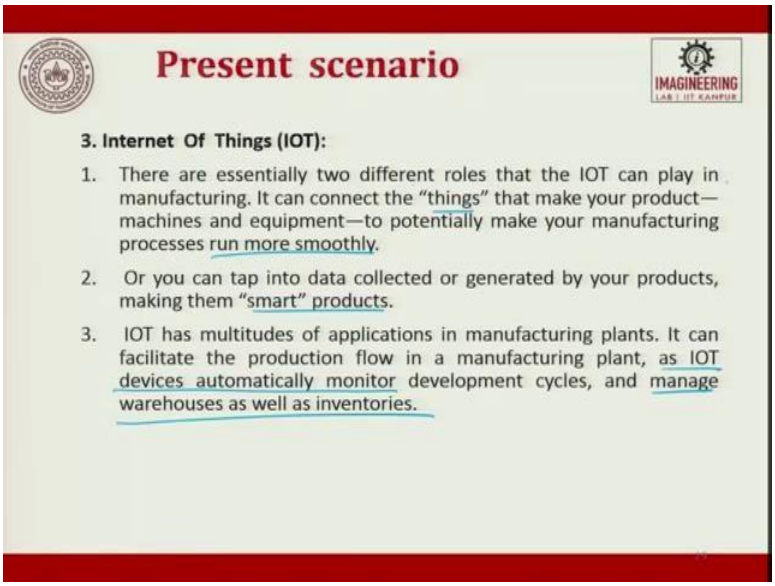

There are essentially two different roles that an IOT can play in manufacturing. It can connect the things that make your products, man, machines and equipments to potentially make your manufacturing process run more smoothly.

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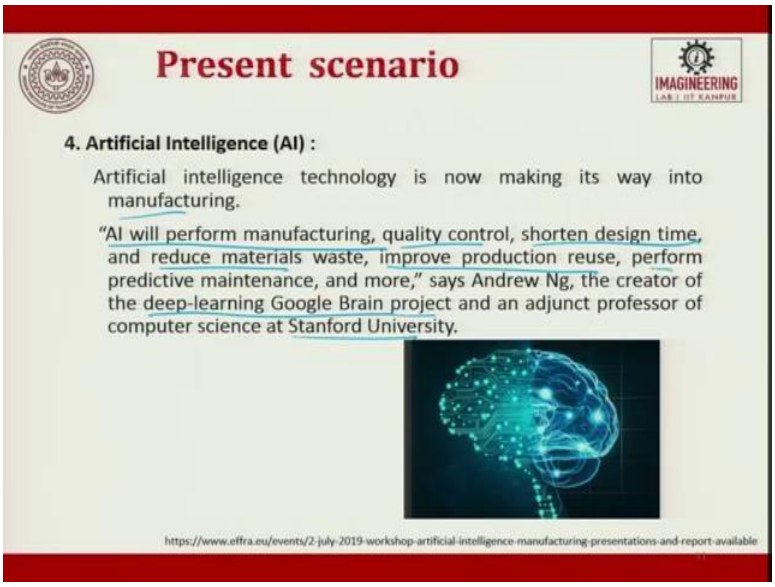

The last one is artificial intelligence. Artificial intelligence is a technology is now making its way into manufacturing. AI will perform manufacturing, quality control, shorten design time, reduce material wastage, improve production reuse, perform predictive maintenance and more, says Andrew Ng, the creator of deep learning, Google brain project and an adjunct professor of computer science at Stanford University. He says very clearly AI will form manufacturing, quality control, shortening design time, reduce manufacturing waste, improved production reuse, perform predictive maintenance and more.

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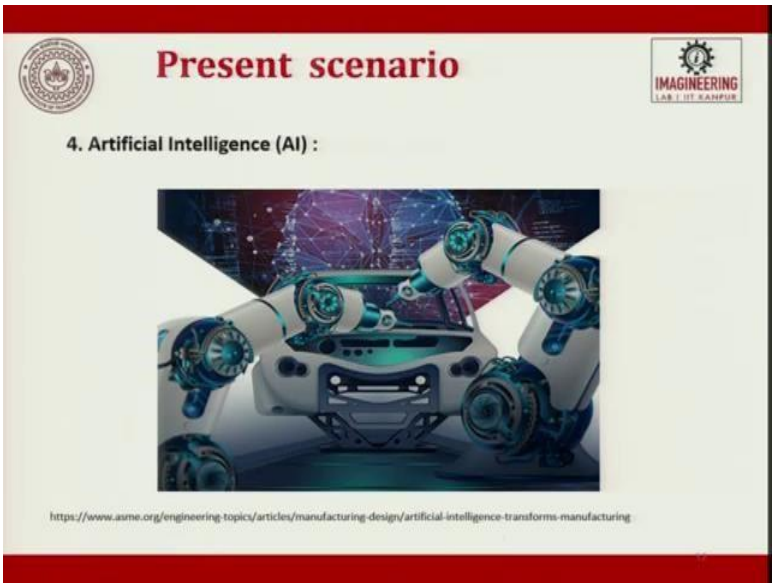

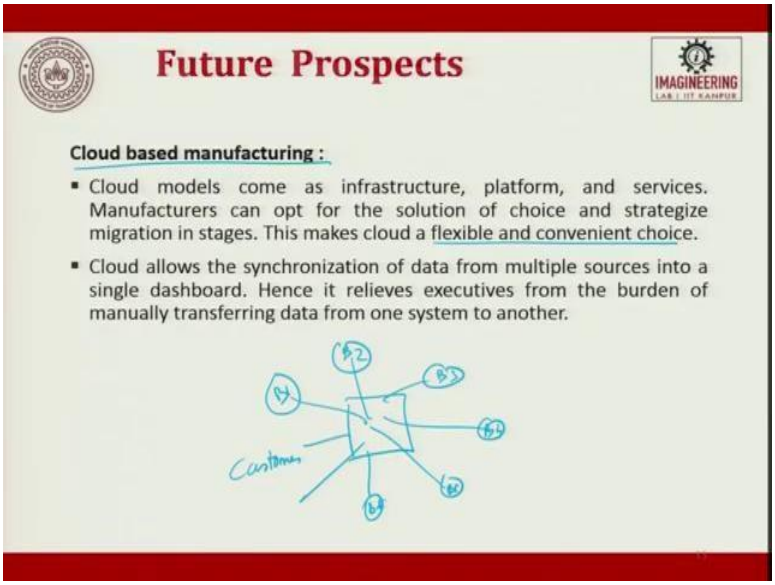

This is artificial intelligence based assembly line system which is happening.

We also talk about cloud based manufacturing today, cloud models come as infrastructure, platform and services, manufacturers can opt for solutions of choice and strategy, migration in stages. This makes the cloud a flexible and a convenient choice. Today, what we are trying to talk about put everything in the cloud, get a cloud space, a software is there, stimulated data you can store it there. You do not have to have a server everything is in the cloud and when you required, you can pull it up and start using it. The cloud allows the synchronization of data from multiple sources into a single dashboard. Hence, it relieves executors from the burden of manual transferring data from one system to the another.

Today, we are also talking about cloud based banking. So, almost all the servers across the globe will start talking to one cloud point where information will be stored in one point and then you start using it. So, these are customers, these are banks, Bank One, bank two, bank three, bank four and bank five. So, all these banks will try to store all the data and this data will be kept in a cloud space, it is accounted there it is it is also monitored there if you want to retrieve data you can pull from there and start using it.

In the similar way, we are also trying to talk about simulations today. So, a lot of software are now available in cloud, so you do not have to buy software, use those software which is available in the cloud for that time whatever you want, it gets maintained and it gets advanced. So, here cloud allows synchronization of data from multiple sources into a single dashboard. That is the beauty of cloud based manufacturing.

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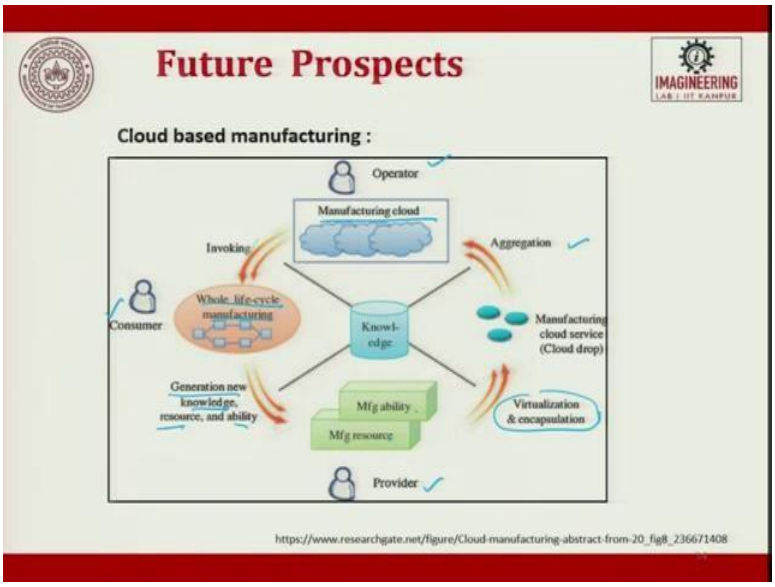

So, today, this is what is cloud based manufacturing, you have manufacturing cloud, you have a knowledge base, manufacturing, resource manufacturing ability, virtualization and encapsulation, and this is the whole life cycle manufacturing we are done, a consumer and operator and then you have aggregation and a provider. So, these are all put together and stored in a central place and you can see the whole life cycle manufacturing can be seen. So this is aggravation and this is invoking.

So generation of new knowledge, resource and ability happens from the lifecycle, manufacturing ability is tested, then we do virtual, then we try to manufacture, then we try to give it to the aggravation to the cloud space.

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So, in this course, we are planning to have four sections. So, introduction of computer integrated manufacturing CIM, which is almost done. So, next, we will start looking into CAD Computer Aided Design, then we will get into Computer Aided Manufacturing. Then we will talk about Computer Numerical Controls. Then we will talk about computers in manufacturing systems, advances in CIM.

This course is reinforced with laboratory demonstration, self-completion tasks, reading articles and weekly quiz, I would request you to start working on this reading material and self-completion tasks. This will try to enhance your knowledge about this course, start enjoying this course, and as and then we keep moving, you are also having an open forum so wherein which you can start putting your questions we will be happy to answer.

But please try to do the assignments regularly and properly.

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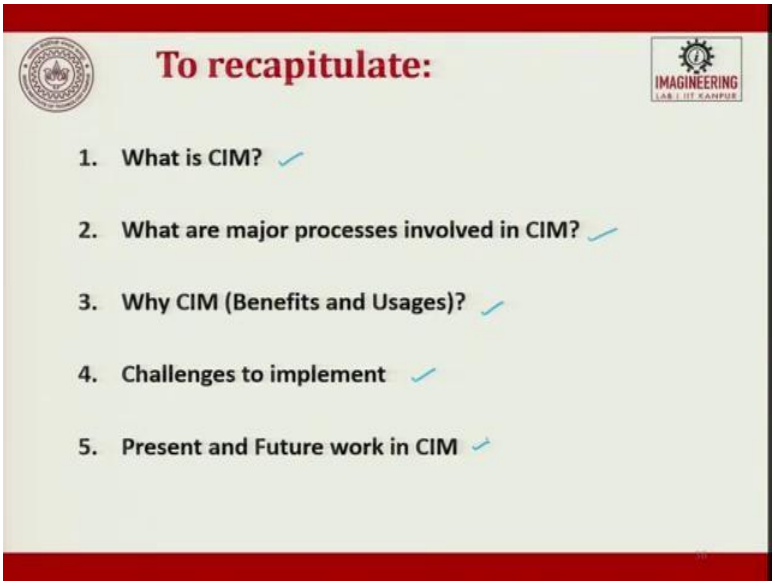

So, to recap whatever we have seen, we have seen, what is CIM? Then we have seen what are the major processes involved in CIM? Why CIM benefit and usage? Challenges in implementing CIM? Present and future work in CIM.

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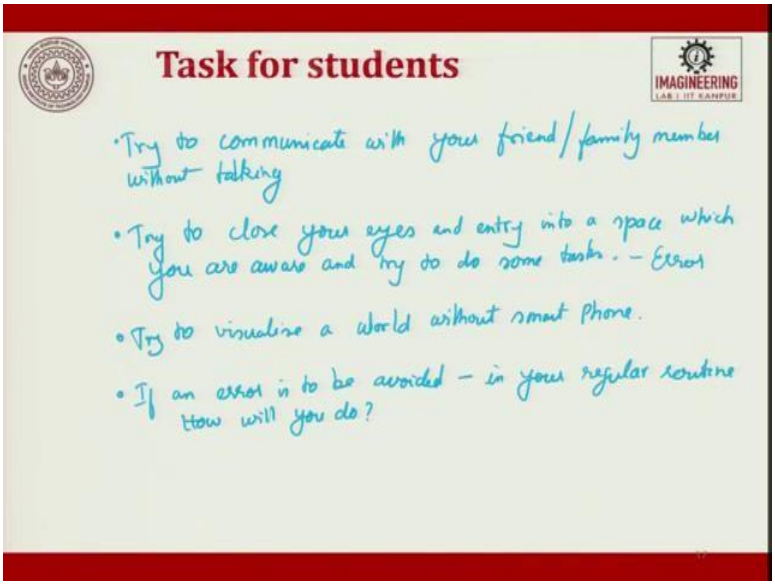

So task for the students. Try to communicate with your friend/ family member without talking. You have to communicate with only action. So, then you will see what amount of difficulty does these neutral files play. They try to understand what you want, and then you try to execute the other thing. Next thing, try to close your eyes and enter into space which you are aware, and try to do some tasks, why am I doing?

So, this is nothing but the sensors if the sensors are not available, then you will see what amount of error you make while executing the task. And please keep in mind you are very intelligent the system human being is a very intelligent system, and you are trying to do in a space where you regularly go. Third, try to visualize a world without smartphone. So, you will see what amount of difficulty you will face in connecting with people in communicating with people. And today you will see how important that data is. We were talking about data flow and other things.

Last one, if an error is to be avoided, again in your regular routine, how will you do? These are some of the tasks you do not have to submit it to me. All these four tasks are only taking to this course; we are not trying to do any philosophical study, try to communicate with your friend you have to do it in a way such that he understands, but you should not open your mouth, you should not talk. This tries to tell you how difficult it is with communicating between two entities without a neutral language. Next, you will close your eyes that means to say a sensor, a sensor is now nullified and you are trying to do the operations and see what is the error.

Then the third one is, try to live with a world without smartphone, to see that how do you get communicated with people and you see how important is data. And the last one is the year is to be avoided. You do any operation an error to be avoided. So how do you make sure that error can be avoided in your regular routine, it can be placing of your bag, placing of your pencil placing of your tie placing of your shirt in a house, then how do you make sure that does not happen?

Because this will try to tell you how difficult it is to automate and get things done and enjoy the automation. So, with this four tasks, I would like to complete this lecture. Thank you very much.