Introduction on Intellectual Property to Engineers and Technologists
Prof. T. K Bandyopadhyay
Department of Metallurgical and Materials Engineering
And
Rajiv Gandhi School of Intellectual Property Law
Indian Institute of Technology, Kharagpur

Lecture – 31
IC Layout Design and Basic

So, this module again, we will discuss about another two forms of IP; last module we discussed two forms of IP: trademark and geographical indication. And, this module also, we will go for two another forms of IP, that is, IC layout design.

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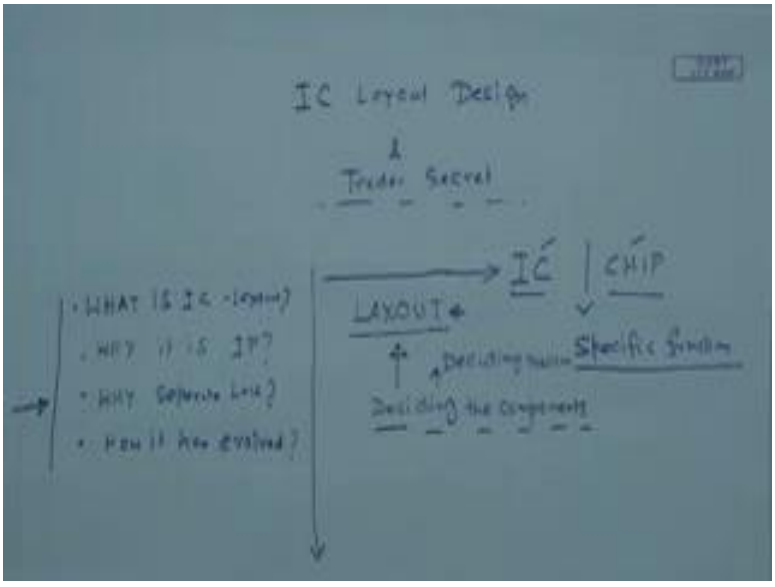

IC layout design and trade secret; so, let us start with IC layout design. So, if I ask, what is the importance of IC layout? So, you know today's context. The electronics devices and component have been growing and people are utilizing the IC in different components including mobile, others electronic devices that is used even for medical purposes. So, what is IC layout? I told about IC or chips integrated circuit or let us say chips. So, what is IC layout? On that context, I will ask you when you construct a building, first foremost thing is let us say plan, may be layout; then you construct the building.

Similarly, let us say if you have designed a product in a tangible form; before that, you may have thought about it is engineering drawing in the form of a plan, elevation perspective views. Then, you generally build that article out of those plans. So, building of article building of plans; or, I am thinking about let us say building of a tangible object; it will be easier if you prepare a layout or drawing of that object first. Then, you prepare that thing.

Similarly, let us say IC or chips it has been fabricated; it is fabricated using different steps are involved with the fabrication of the IC or let us say chips. So, just like a building layout or building plan and elevations, articles, drawings and articles. Similarly, here that, IC just like let us say IC or let us say chips. So, how it is fabricated definitely you understood. IC or chips - why you use? You use for a specific function. You use those things for specific function. So, say IC and chips definitely is coming in the form of a tangible object. In the fabrications of that tangible object, say one of the components is also the design of layout, layout of that IC.

So, how you are designing the layout? Maybe based on functionality you are deciding the different component layout; deciding the components - deciding the components; then, deciding their position. So, based on this, you are creating layout. So, layout will ultimately tell about the different components and their positions. Based on that, you used different fabrication methods just like photolithography, CVD; and you prepare layer wise you fabricate the integrated circuits or let us say chips. So, that there lies the importance of layout for preparation of IC or chips.

So, now, if you ask me, where is the IP involved in the layout? Definitely IC or chips is the product of intellectual contributions. So, intellectual contributions involved in the creations of IC and chips and the layout is the intermediate steps to create the IC and chips. So, major intellectual involvement happens in the creation of the layout because layout you are creating based on the functionalities; then, you are deciding a particular fabrication method to fabricate that IC or chips. So, there lies the role of layout in chip or IC fabrications just like a plan or layout for construction of the building. So, definitely, intellectual contribution or creation of minds or then I am considering that, this is layout. And, you are justifying intellectual property because they are also - it has utility; it has utility; it has value. And, it involves fruit of labors. So, ultimately you are thinking it is a form of intellectual property. Agree?

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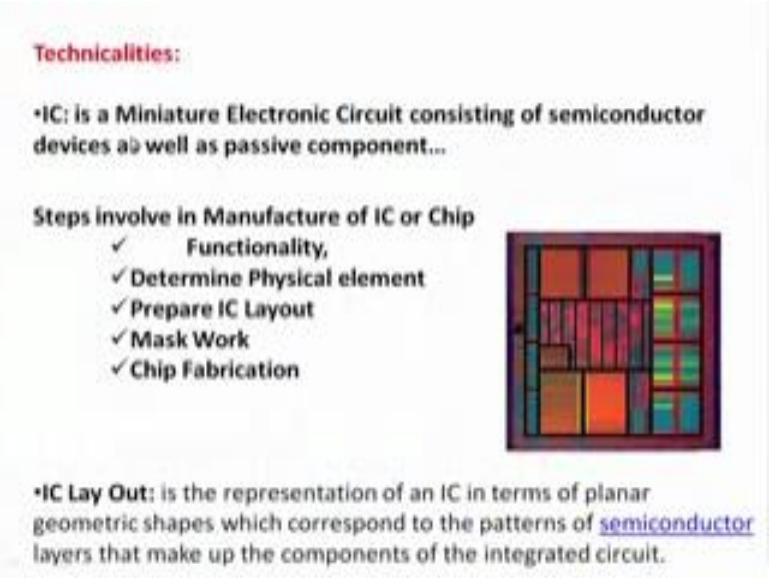

Now why it is required to protect by means of intellectual property and why separate form of intellectual property is required? That part we will try to discuss now. So, now, let us see - what is IC? So, just I am taking the definitions from the book. Definitely you know that, IC performs integration or integrated functions. So, IC is a miniature electronic circuit consisting of semiconductor devices as well as passive components. So, sometimes I used to tell it contains capacitors, transistors along with another circuitry element. So, it involves and it performs what function? Electronic circuitry functions because electrical circuitry functions differ from electronic circuitry functions.

And, steps involved in manufactures or fabrication of IC or chips is first you decide the functionality. I already told designing the physical elements required; prepare the layout; mask work. This also I have to prepare. Then, you fabricate the chips. And, IC layout is the representation of IC in terms of planar geometric shape which corresponds to the patterns of the semiconductor layer that make up the components of the integrated circuit. I already told you, what do you mean by layout and what is it is importance.

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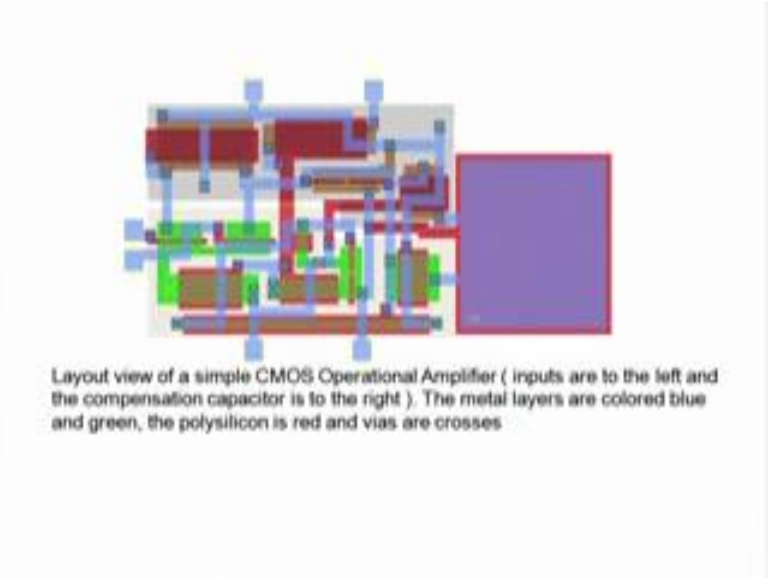

Now, if I ask that, let us see this is a CMOS operational amplifier layout; that is a layout of CMOS operational amplifier. How metal layers are colored blue and green; the polysilicon is red and vias are as crosses. That is the layout of CMOS amplifier.

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So, now why need protection for IC layout? Because that if you procure the electronic devices or electronic components; then, you can able to identify the chip or IC. Now, you may do a reverse engineering process to find out the layout involved in fabrication or manufacturing of that chip. So, the person who has involved so much investment

including intellectual and capital investment for preparation of chips including layout, it is piracy is easy. So, important to say that, that way chip piracy is easy; enormous cost involve in design and development of chips; pirate sells the chips at a lower price. So, let us say somebody invested a huge amount of money and another person is without involvement of it is investment is he will definitely sell those chips at lower prices, so that we will ultimately deprive the actual creators to get return on investment. So, then we will not be interested to do further investment. So, definitely we need protection of the layout.

So, now, why separate forms of intellectual property? Why not existing forms of intellectual property is sufficient to protect the IC layout? So, I just like say if you know I have learnt now copyright; if I asked the building layout whether existing forms of copyright whatever I discussed will able to protect. Definitely you have understood the layout of the building required some sorts of intellectual contribution. So, whether which forms of IP will be appropriate for that? Definitely copyright, now, again from the layout, you constructed an architectural work just like a building; this is also copyrighted work.

Now, the question lies whether the copyright owners will get separate protection for the layout and for the architectural work based on that layout whatever architectural work has been constructed or constructed. I will say yes, because sometimes from the layout, say buildings have been constructed, but it will be difficult to enforce his right in the building part based on his right on the layout part, because if I consider layout, then he has the right on the right based on the layout part right to adaptation or as per the US (Refer Time: 12:34) right to create the derivatives work – right to create the derivatives work. So, sometimes it will be difficult to enforce the right based on the substances similarity taste losing the right to adaptations. So, I think it will be impudent to take separate copyright for the layout and also the building in the form of architectural work.

So, now similarly, let us say try to consider semiconductor IC layout whether patent will give protection or not or what is the deficiency in the patent for giving protection of IC layout. So, why not patent I have written here. So, integrated circuits are composed of numerous building blocks; you understood that each block being patentable. I told you it can be created in a layer wise structure. And, each layer may be patentable. Integrated

circuit contains hundreds or thousands of semiconductor devices claim to integrated circuit would have to cover hundreds or thousands of individual elements.

Consequently, patent claim that, attempt to recite an entire integrated circuit may be hundreds of pages long. In respect of patent, you know that, patent we required sufficiency of description and in the description – about description we have a portion called claim. So, we are understanding that, it contains numerous building blocks; each block is patentable and also that, to describe the different building blocks, you require a huge-huge that huge amount of description and also you claim every elements presented in that building block. So, ultimately, it will be tedious job for a patent drafter to cover every element within a single patent specification within a single patent specification. So, it may be hundreds or thousands of pages, so that that way that will be complex, cumbersome to write a patent specification with reference to the IC or IC that contains also layout.

Although if you ask me, people try to get it protected within the patent systems, because people thought patent is the forms of IP which can be more useful and which can be easily – which can be enforced. So, that part. So, there is another part in patent acts that, obviousness rejections sometimes one layout to another layout; definitely may not be qualified to qualify the inventive steps criteria. So, then say another person who will create the second layout based on the earlier layout, that may lack the inventive step requirement and he will not get patents on the layout, because the inventive steps you understood will be just based on the prior art and the person's skill in the art.

So, that way some way inventive steps requirement is also a sufficient lap over the existing prior art. So, that part may be lacking; may lack in respect of IC layout. Another part is that, you know that, to get a patent present day people are discussing on that part to get a patent; sometime it takes 3 to 4 or ever more time even any jurisdictions. And, the life of IC or chips is very short because the lot of invention, innovations are happening in electronics world that makes the life of chips and layout very short. So, ultimately, 3 to 5 years if it takes to get patents on IC; in that time, it is commercial potential got will be exhausted. So, that is the say hurdles with reference to patent on IC layout, then why not industrial design?

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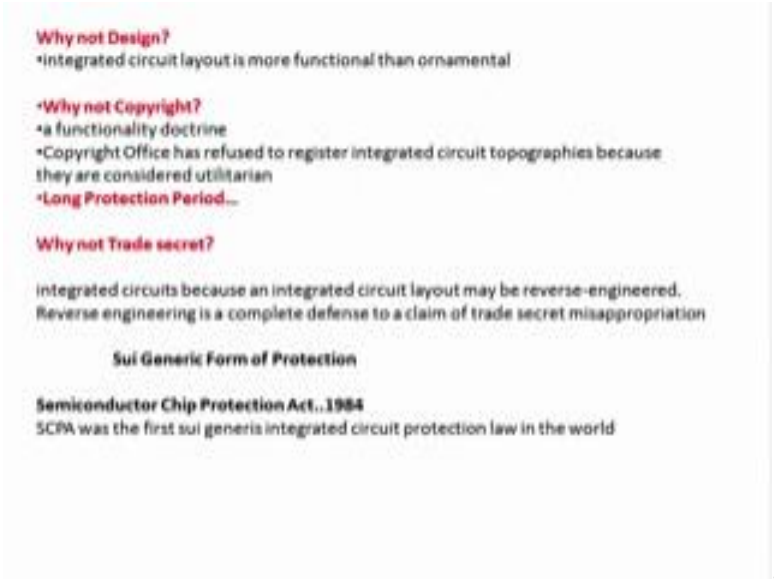

Integrated circuit layout is more functional than ornamental because you understand the IC layout design is considered to the functionality of the chips. So, functional part does not cover under the design. And also, what ornamental features involved in layout? Nothing, industrial design is not sufficient. Why not copyright them? Definitely also you know that it has also emerged from a copyright doctrine; and, even sometimes people told that, in US, people are still trying to protect it under the purview of copyright because the theoretical aspects suggested copyright that does not protect the utilitarian aspects and functionality when, which type of articles are more functional; their copyright where a copyright is extinguished. So, copyright office has refused to register integrated circuit topography because they are considered utilitarian because integrated circuit layout is mostly having utility; for the reason, they register – they have denied the registration of the copyright on IC layout.

Again another problem with copyright is that, the period of protection is longer life, lasts 60 years and, I already told you that, life of IC layout is short; means after life plus 60 years, it will be considered as public goods, so that it is not beneficial for the society as a whole. And ultimately, whom I am providing the rights on IC layout, the owners also will not get much benefit, because the life is only very short. So, definitely we do not require a copyright protection on IC layout for life plus 60 years. So, for that reason that, IC layout copyright also not sufficient for IC layout design. Then, trade secret maybe; but, another problem with the trade secret I already told you that, reverse engineering is a

valid defense in respect of trade secret infringement. Somebody developed a IC layout and he claimed that, I developed that IC layout not from – say without any contribution – not like that, I have developed that IC layout using reverse engineering route, because reverse engineering is a complete defense to a claim of trade secret misappropriation or infringement.

So, what option? Trademark, no? Why trademark? This is not a source indication functions. So, that way whatever the forms of IP we have discussed and just like discussed; that will not be applicable to properly protect the IC layout design; that lead the creation of a sui generic form of protection – one of it is own kind. So, that leads to the development of semiconductor chip protection act, 1984, USA. Then, if you read the jurisprudence that, US - it has been originated from USA; subsequently in other countries – Japan, Korea. That is also say debate with reference to some provisions of the US act between US and Japan. Then, I understood that, I do not require, to discuss all those things now. But, subsequently, all other countries also created a sui generic form of protection to protect either IC layout or mask work just like the Japan, Korea; and, European countries also created some directives to protect IC layout design.

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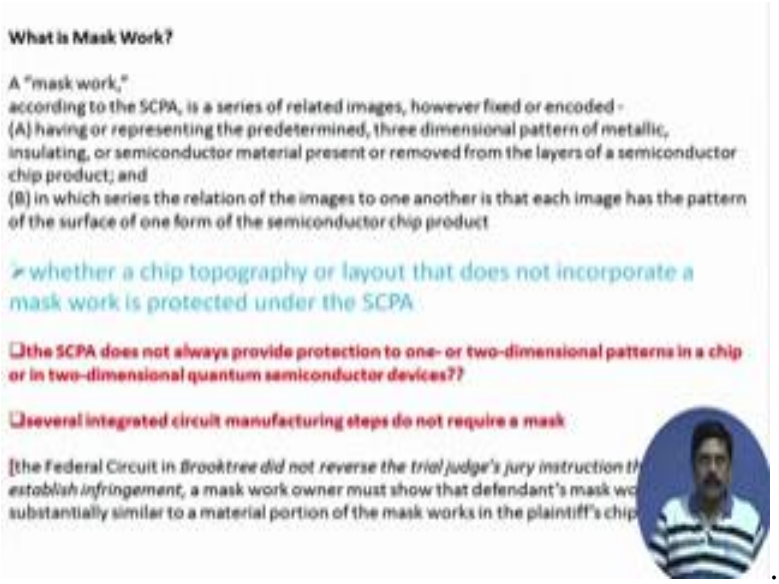

Then, subsequently that TRIPS has come up and IP IC treaties. And, TRIPS has provisions for protection of IC layout design; that lead to the say India signs the TRIPS agreement. So, ultimately India has to enact say legislations related to protection of the

IC layout design. So, we have semiconductor IC layout design act 2000 to protect IC layout design in India. Just like say I will just give you some of the other features just like a mask work, just like SCPA - semiconductor chip protection act as mostly told about the mask work. So, now, what is mask work? As you are technical graduate, take these definitions and try to imagine what it is. So, according to SCPA, is a series of related images, however fixed or encoded. See that fixed or encoded - having or representing the predetermined, three dimensional pattern of metallic, insulating or semiconductor materials present or removed from the layers of a semiconductor chip product; and, in which series, the relation of the images to one another is that each image has the pattern of the surface of one form of the semiconductor chip product.

So, you understood a series of related images – fixed or encoded having or representing the predetermined, three dimensional pattern; understood that part. So, if I ask that layout and mask work, whether both are same; I will say even from layout, you are creating into another step is called mask work. From the mask work, you are creating ultimately the chips. So, that way the mask work or IC layout two intermediate steps involved in fabrication of the chips; different countries try to protect either layout or mask work. SCPA does not always provide protection to one- or two-dimensional pattern in a chip or two-dimensional quantum semiconductor devices; understood? So, that is the mask work.

Let us say you understood that IC layout design is a form of intellectual property; clear? Why intellectual property is clear to you? And, what is the importance of IC layout design; that is also clear to you. Definitely, importance includes to prevent piracy, that I already referred. And, in IC layout design – the evolution of IC layout design in the form of IP - a separate form of IP; that also we are discussing here. Ultimately, why not patents; you understood. In that regard, you got to know even the revised - the criteria of patentability; why not copyright. So, also you understood why not industrial design; that also you understood. Why not trade secrets just like - whether I can consider this as a form of information or confidential information; but, what is the lacuna with reference to the applicability of the trade secret law to protect the IC layout design; that also you understood. So, then why not industrial design; you understood.

Now, that lead to the - what lead to the enactment of separate legislation for say IC layout design; that also understood. What is the jurisprudence? Somebody asks you what

is the historical background for protection of IC layout design in India; definitely you will refer the TRIPS, provisions and we have signed the TRIPS agreements in 1995. And, during the signatures of the TRIPS agreement, India was treated as a developing country. And, TRIPS provided 10 years window period for developing country to comply with the provisions of TRIPS. So, in TRIPS, there are articles - few articles have been devoted with reference to the IC layout and they mentioned the country as to enact some legislation for protection of IC semiconductor - IC layout. So, ultimately, India has also created legislation for the protection of IC layout design, that is, semiconductor IC layout design act, 2000; and, they try to give the protection of by protection of IC layout.

So, let us summarize the class now. This class, now we discussed about what is IC layout? Why it is IP? Why separate law? And, how it has evolved; specific reference to the India. So, this is the summary of discussion with reference to this class. Subsequent class, we will discuss about the registrations procedure and enforcement procedure with reference to these forms of rights specific reference to the India as we are mostly discussing Indian provisions. Also, sometimes we are touching the others-other jurisdiction provisions also; but mostly we are discussing the Indian provisions. So, next class, I will discuss about the registration procedure of IC layout design with specific reference to the India.