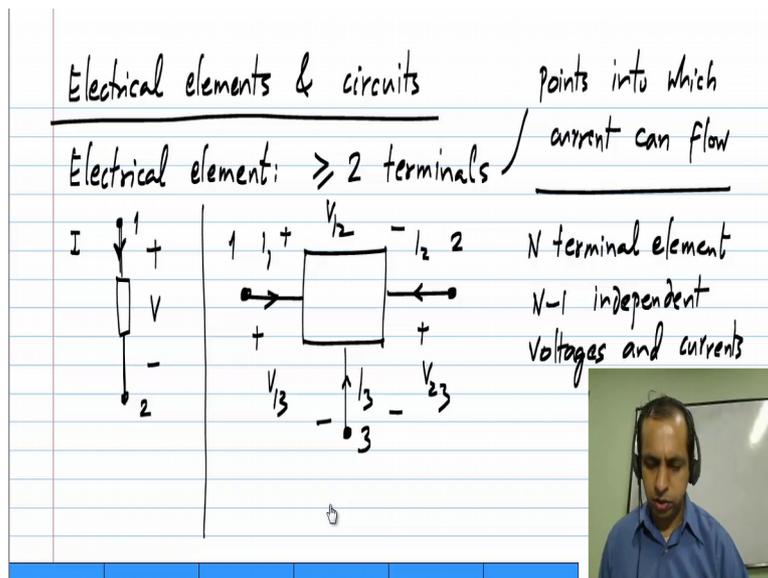


Basic Electrical Circuits
Dr Nagendra Krishnapura
Department of Electrical Engineering
Indian Institute of Technology Madras

Lecture – 04

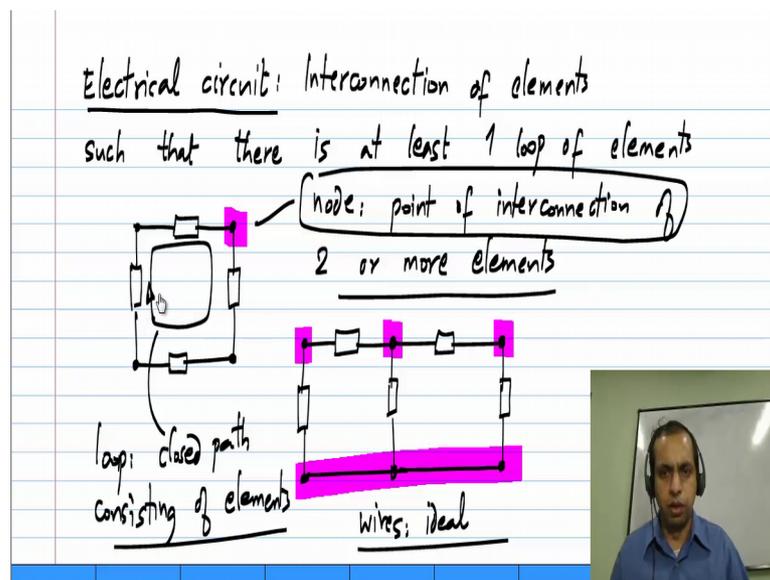
(Refer Slide Time: 00:03)



We will now look at electrical elements in circuits. An electrical element has at least two terminals, and what are terminals basically they are points into which current can flow. So the generic element is represented by a box with two wires sticking out like this so this is terminal 1 and terminal 2 and a current can flow through this terminal, and we measure voltages across any pairs of terminals. In this case, we have only one pair of terminals and we have just a single voltage that can be measured. And the key point is that for us, we will only work with the relationships between V and I that is V between the terminals and I going through the terminals that is good enough for us we do not need to worry about the internal details. The internal details are required for designing the element, but not for circuit analysis.

Now, of course, we can have electrical elements with more than two terminals. We can have an element like this, which has three terminals. We can have currents going into all three of them, and we can also measure the voltages between any two of those terminals. Now soon it will become clear that if we have N terminal element there are N minus 1 independent voltages and currents.

(Refer Slide Time: 02:55)



Now, what is an electrical circuit, it is basically an interconnection of elements such that there is at least one loop of elements. I will show this with examples of two terminal elements, so we can have some components. Let us not worry about what these components are at the moment, so we can have a number of components connected here, a loop is something where you start from a node, and you go trace the elements and somehow others you can go through many elements and come back to the same node. And what is the node, it is a point of interconnection of two or more elements. Now what is this definition of electrical circuit, we said that we have to have at least one loop so that is because we want to have some interesting behavior in the circuit that is if I have a circuit such as this.

Let me take just a single element, there is no loop, you will quickly see that the current in this will be zero, so it is not interesting at all and it is not just a single element you can have a number of them chain together. Still if the no loop is formed at all then the current through this will be zero basically these circuits are not interesting at all to have some interesting behavior in the circuit you need to have at least one loop. Node is point of interconnection of two or more elements and loop is a closed path consisting of elements. Now these are all important concepts, when we later go to analysis of circuits.

Now, it said the node is point of interconnection, so what it means is not necessarily that it is physically drawn as a point, and it could draw like this. Let me draw a circuit of this type and as far as we are concerned now, the wires will have no resistance whatsoever; all our wires

are ideal; that means, that their ideal equal potential and so on. Now this whole thing here which is a point of interconnection of this element, this element and that element is a node. So this is the node that is a node that is a node and this whole thing is a single node.