Structural Reliability
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Lecture –111
Representation of Systems (Part -15)

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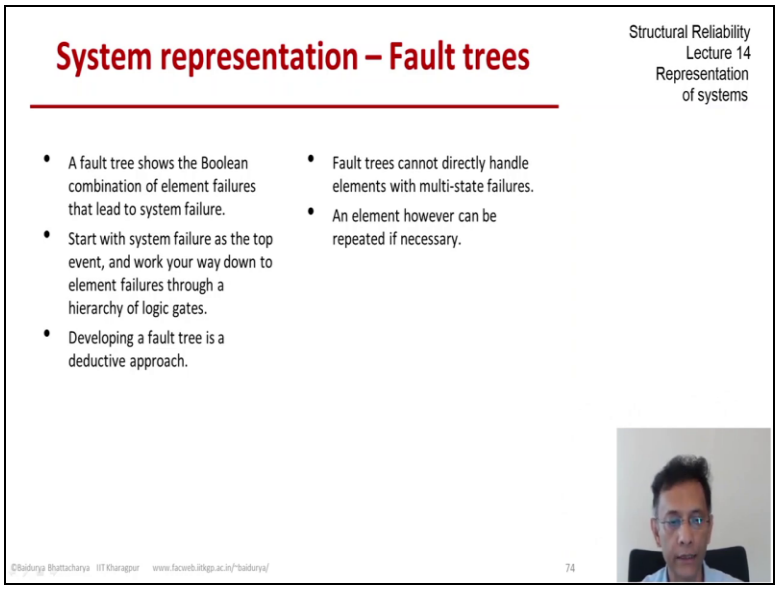

We continue with our discussion on representation of systems we have already discussed structure functions, block diagrams cut sets and the last topic we will look at in detail is fault trees. So, what is a fault tree? It is a very powerful method very versatile and also very intuitive it shows the Boolean combination of element failures that lead leads to system failure. So, we start with the system failure as the top event and work our way down to element failures through our hierarchy of logic gates.

So, we go on until the point that no further expansion is necessary or are possible it is a deductive approach. So, it requires a good understanding of the system architecture it cannot directly handle elements with multi-state failures. So, each element in the fault tree must represent a pure failure mode. And we will look at one example of the three state diodes to see how we can represent that system in terms of a fault tree.

But we can repeat an element as much as necessary and that also brings in dependence in the

whole system and we will see one or two examples of that as well.

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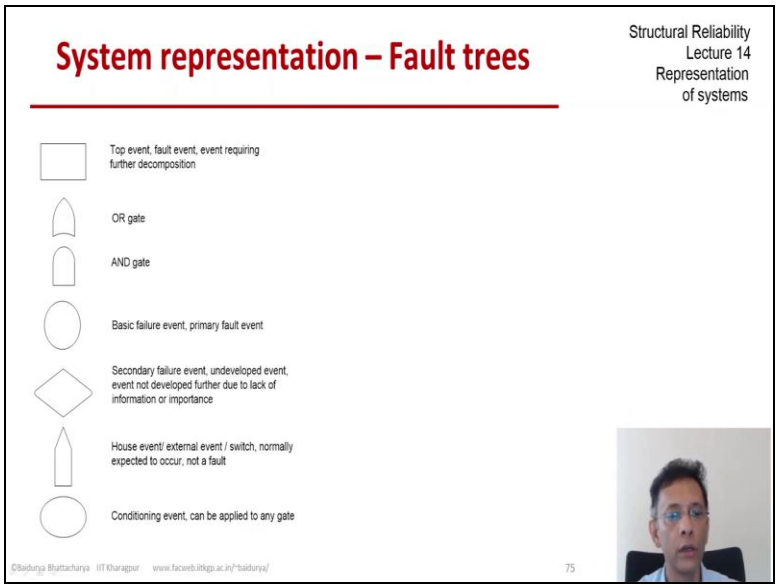

A fault tree uses a number of symbols they are not too many number the ones that are commonly used is the rectangle for the top event the ultimate fault event from where we walk downwards. Then there are two gates that we commonly use the or gate and the and gate and they basically play the same role as the union and the intersection of sets respectively there are other gates which are occasionally used like exclusive or and so on.

We can use a conditioning event with a gate also if necessary and that is the last ellipse that you see on the list there are basic failure events when we come down from the top event and we do not need to go any further we have reached the basic for a certain branch. So, that would be the basic failure event represented in terms of a circle. There are undeveloped or a secondary failure event that we do not it is either not possible we do not have information to expand them further to develop them further or they are not important enough to take the effort.

There is also the house symbol for external events or switch events or those events that are expected to occur then they do not represent a fault.