Structural Reliability
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Lecture –157
Capacity Demand Component Reliability (Part 05)

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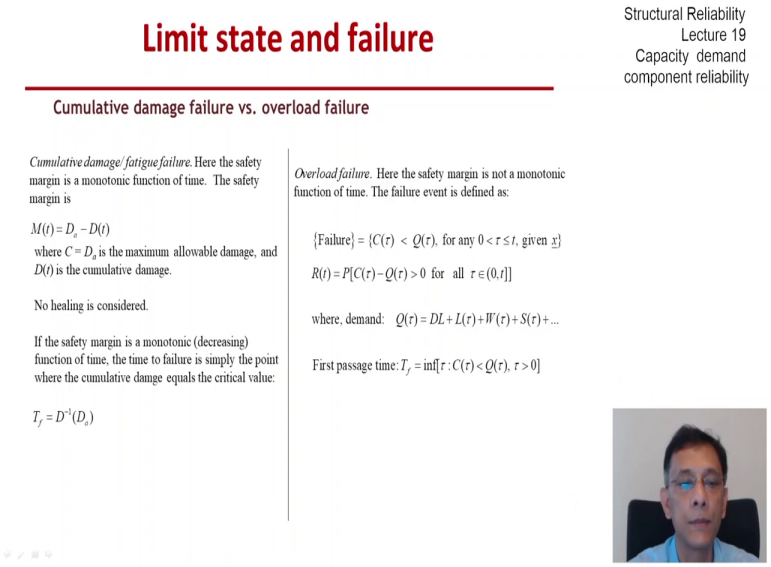

In structural components the limit states can often be broadly grouped into two types one is the cumulative damage type failure and the other is the overload type failure. So, in the first kind and fatigue is a very common example of that the safety margin is a function of time and often it is taken to be a monotone function of time and it looks something like this. So, it is D which is the acceptable damage which in some sense in the capacity minus the demand which is the accumulated damage.

So, since and we do not consider any healing. So, that's one of the reasons that this is considered to be a monotonic function. And then it is easy to find out the time to failure and that would be the time that this accumulated damage exceeds that critical value. If it is not monotonic then is the first time that this happens would be of interest for us. In the overload type failure the safety margin does not have to be a monotonic function of time the failure event is defined as I said C

capacity being less than Q demand.

I am going to use Q for demand in many occasions. So, sometimes I am going to use the letter D but if there is copper confusion I am going to switch back to Q. So, that the reliability function is a C at any tau greater than Q at that tau for all such tau. So, that is the reliability function now this demand again in a sense of linear combination could be the superposition or some combination of various individual demands for a structure it could be dead load wind load live load seismic load and so on.

And so that the first passage time the time to failure is the first time that we have this accidents occurring. So, the demand exceeding the capacity the very first time that that happens would be my time to failure.