Structural Reliability
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Lecture –224
Capacity Demand Systems Reliability (Part 15)

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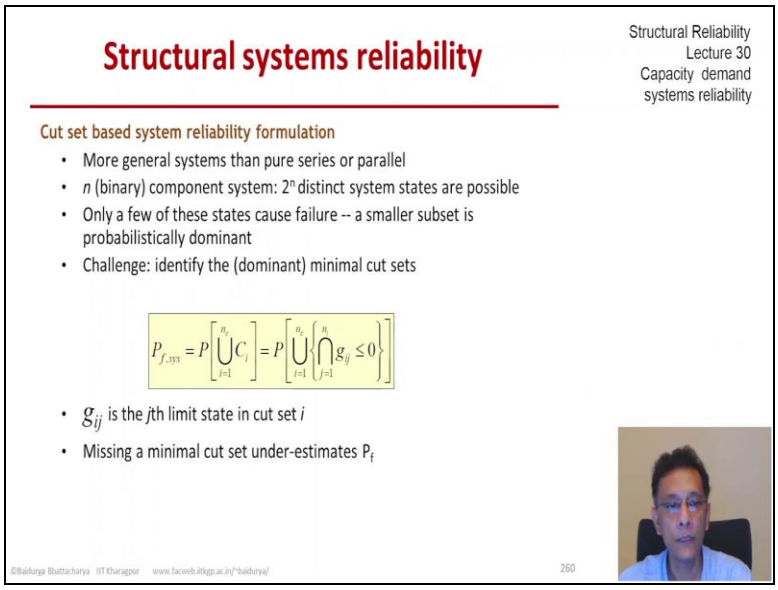

When solving series systems, we showed how FORM can be used to compute the series system failure probability. We can do something similar for a parallel system and the general expression for a purely panel system is what you see on the screen but one has to be a little careful. Because as we have seen if there are sequence effects, if we need to consider the limit states after there has been partial collapse of the structure.

Then ah all these g's, all the individual limit states they need to be properly defined, but as long as that can be done we have the answer in terms of the multi dimensional normal CDF. If we have a minimal cut sets so it is not a purely parallel system, but there are number of cut sets, and so the system feeling probability is the union probability and so then each cut set is composed of its own members, each minimal cut set, is composed of its own members.

And cut set i has, and i such members and g i j is such a limited state in the cut set i. Again, we

need to make sure that any sequence affects any partial failure if that is how we can analyze the structure that so we need to analyze the structure is taken to account when defining the respective g's. Now this also gives us an idea that are there other approximate ways in defining or in estimating the union probability like what you see here p of union C i, i going from 1 to nc.

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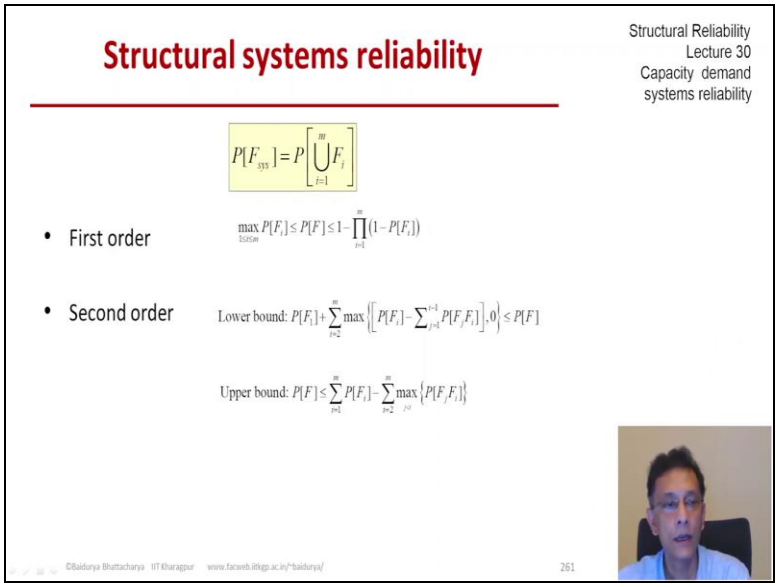

So there are some very well known famous bounds that are put on these union probabilities. There are the first order bounds that you see on the screen and there are second order bounds the second order lower bound and the second order upper bound. Basically, uh, the order implies what sort of joint event we have information of probability for. So, if we have just marginal probabilities so that gives us the first order bound.

If we have pounds of F i F j f being the failure in the cut set, i etcetera, F j failure in the cut set j. So, if we have those type of second order joint probe information, then we can improve the bounds compared to the first order bounds and get an estimate sometimes these bounds can be quite good sometimes they are too wide to be useful. If you have third other probability information third out of joint probability then we can have third of the bounds and so on and so forth. And these can be referred to in the in the literature.

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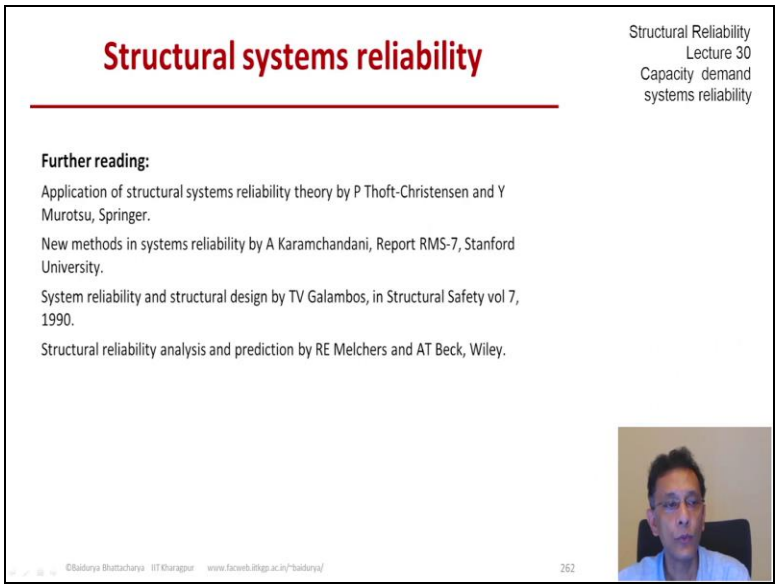

So, to summarize we looked at structural system reliability in this last part of part C of our course we are going to next start with part D, the last part for further reading I would recommend some of these excellent books there is the book by Thoft-Christensen and Morotsu that is, ashish, Karamchandhani is PhD thesis at Stanford. The book by professor Galambos and the text book that you already have mentioned in this course the one by Melchers and Beck.