Structural Reliability
Prof. Baidurya Bhattacharya
Department of Civil Engineering
Indian Institute of Technology-Kharagpur

Lecture-225
Reliability Based Design Codes (Part-01)

With this embark on the last part of our course part D. So, let us take the look back and see the road we took to arrive at this point.

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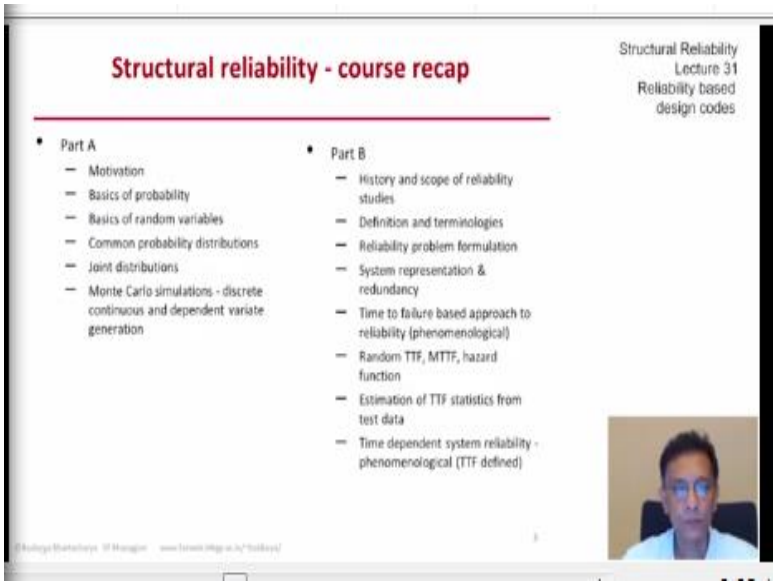

In part A of this course we started with the motivation behind why this course should be useful looked at the basics of probability theory, reviewed the basics of random variables and distributions discussed quite a few discrete and continuous random variables that appear commonly in structural reliability. We looked at joint distributions and in that part B with Monte Carlo simulations particularly how to generate discrete continuous and dependent kind of variables.

In part B we guess and overview about the evolution of the subject of liability and structural reliability. In particular define some basic terms spent a good amount of time on discussing how to formulate a reliability problems. And then how a system can be represented in terms of it is constituent elements and described the types of (()) (02:03) we see in various systems. Then we

looked at we took up the fundamental logical approach to the reliability and time to failure in particular.

So, that TTF was the only random variable describing the uncertainty in the processes. So, that is why we call it fundamental logical and we estimated various statistics of the random time to failure including the meantime failure, the hazard function is a reliability function and so on. We also discussed how to estimate the statistics from a test program. We ended part B with this fundamental logical approach for system's reliability. So, the system failure and system reliability were defined in terms of the time to failure and reliability functions of it is consistent elements.

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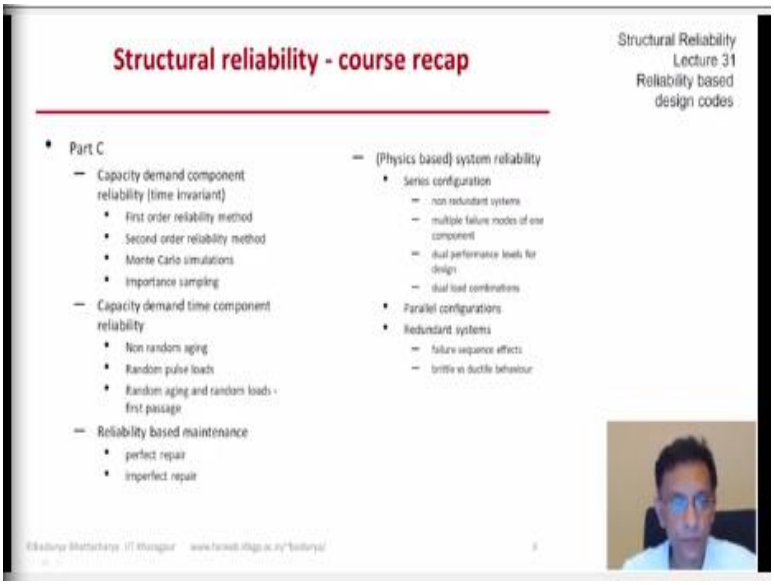

In part C we started with the physics based or capacity demand approach to reliability as suppose to the fundamental logical approach. So, we looked at first the time invariant problems and in that context we discussed the first order reliability method, the second order reliability method, Monte Carlo simulations and importance sampling simulations for estimating component reliability.

And then we introduced the time aspect first in a non random way, so where the capacity and demand are in general the basic variables change with time but in a non random way. And then we brought in randomness first in the form of pulse loads with random magnitudes. Then we

consider the pulses to appear as a process with random magnitudes. And then we looked at the first passage problem in which both the load process and the strength process where random but stationary in nature.

We then looked at we ended that time dependent reliability formulation based on the underlying physics with reliability based maintenance of a component how to take decisions? In which we look both at the effect of perfect repair and imperfect repair and how those affect the hazard function and the reliability function? In the last part of part C we looked at a system reliability formulation in terms of the underlying physics, the underlying mechanics of the system.

And we described first the series configuration which relevant for non redundant systems as well as multiple failure modes of 1 component or 1 structure member dual performance, dual or multiple performance levels that can be used in design and dual or multiple load combinations for various design situations. We then moved on to parallel and other active redundant configurations. We introduced how to bring in sequence effects and how sequence effects are important? Both for 2 idealized material behaviour situations, brittle behaviour on one end and ductile behaviour on the other.

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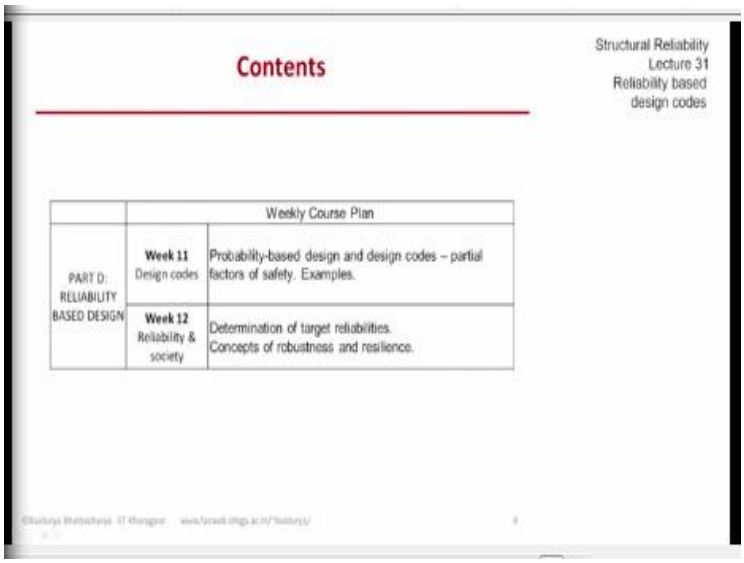

We are now as I said in part D, the last part of our course where we have 6 lectures planned, it is called we have named it part D reliability based design. And we would like to discuss the idea of probability based design and design codes partial factors of safety or load and resistance factors

to be used in design work through 1 or 2 examples. And in the last week the last lectures we would like to address the question of how safe is safe enough? So, how to set target reliabilities and what they should be? And then go out a little more in towards the interface of engineering reliability and society because the question of how safe is safe enough is in that domain.