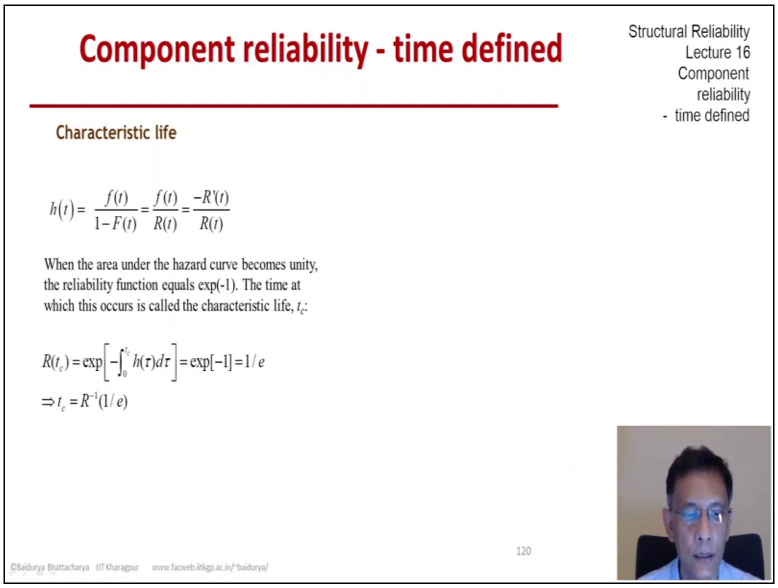
Structural Reliability
Prof. Baidurya Bhattacharya
Department of Civil Engineering
Indian Institute of Technology, Kharagpur

Lecture –131
Component Reliability - Time Defined (Part - 10)

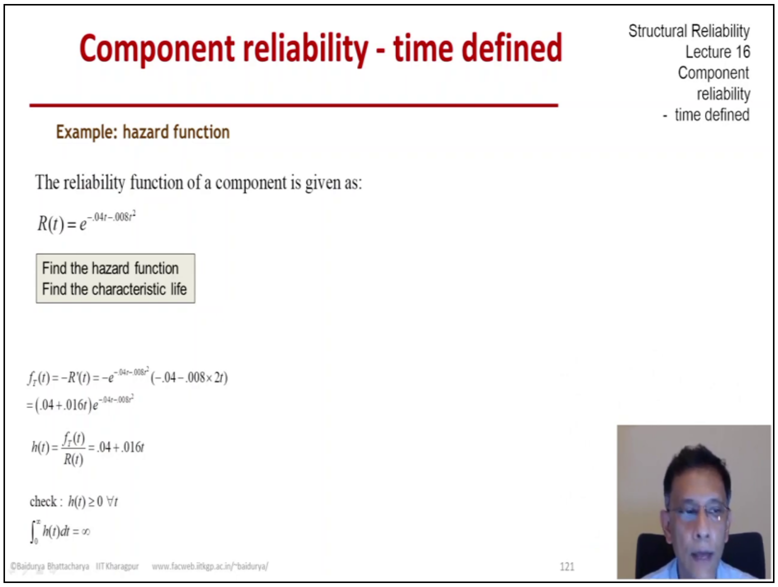
(Refer Slide Time: 00:27)



The hazard function lets us define the characteristic life of a unit you see on your screen all the equivalent definitions of the hazard function in terms of the density function and the CDF or the reliability function. So, and as we discussed the hazard function the area under the function gives us the reliability function. So, the instant at which the area under the hazard curve becomes unity that instant of time is called the characteristic life.

So, the characteristic life is the solution of the equation that when R equals 1 by e, e being the base of the natural log. So in the next slide we are going to solve an example where we determine the h of t and the t sub c.

(Refer Slide Time: 01:37)



Let us solve an example now we have seen this problem before we use this same reliability function to determine the time when the reliability fell to 90%. So, we are going to use this same function to find the hazard function and the characteristic life. So, let us approach step by step the density function which is the negative of the reliability function we can obtain from differentiating R of t as you see on the screen and then we can define we can express the hazard function in terms of ratio of the density function and the reliability function and it is quite straightforward.

What we are left with is a linear function in time. It is a good idea to check whether this function satisfies the two important properties of a hazard function. So, we need to check that h of t is non-negative which is true clearly because t is defined only for greater than or equal to 0 and the integral from 0 to infinity does indeed blow up. So, that is satisfactory. So, now let us go on and find the value of the characteristic life and we again solve the quadratic equation that we did in the past and the solution of this equation in t c turns out to be 8.96 units of time you can compare this value with the number 1.91 that we obtained for the time when the reliability fell to 90%.