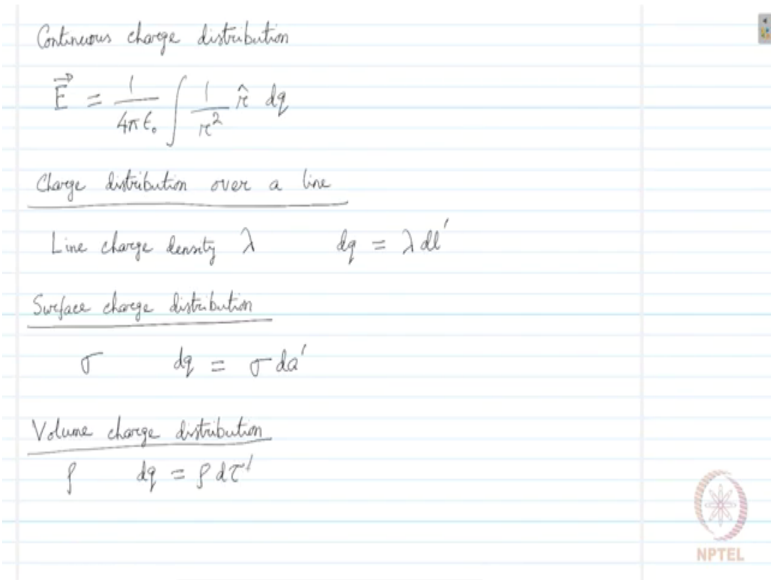
Electromagnetism

Dr. Nirmal Ganguli
Department of Physics
Indian Institute of Science Education and Research Centre, Bhopal

Lecture – 24
Continuous charge distribution: Line charge

So, we have considered the case of discrete distribution of point charges, and now let us move on to considering Continuous charge distribution.

(Refer Slide Time: 00:46)



If we have continuous charge distribution, we can write the electric field as 1 over 4 pi epsilon naught integration over 1 over r squared r cap dq, dq is the infinitesimal element of charge in that continuous charge distribution. Now, we can have a charge distribution over a line that is the simplest example that we can consider.

So, if the line charge density is expressed as lambda, then we can write dq in this case will be given as lambda dl prime. So, primed coordinates are the coordinates of the source charge. If we consider a surface charge distribution, the charge dense, the surface charge density if we express as sigma, then we can write dq will be given as sigma times the surface element da prime. And in case of a volume charge distribution, if we have the volume charge density expressed as rho, dq would be given as rho d tau r prime that is the volume element.