Electromagnetism
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Lecture – 56
Work done by a magnetic field

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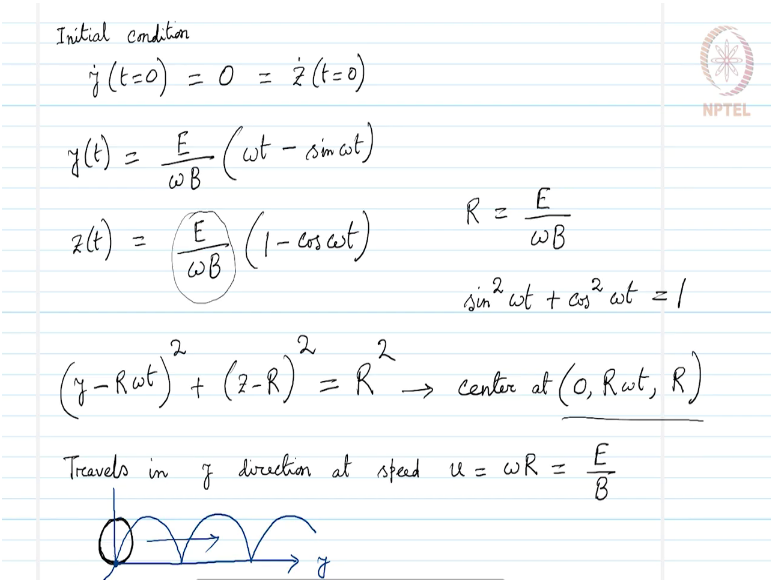

Now, let us consider how much Work is done by the magnetic field.

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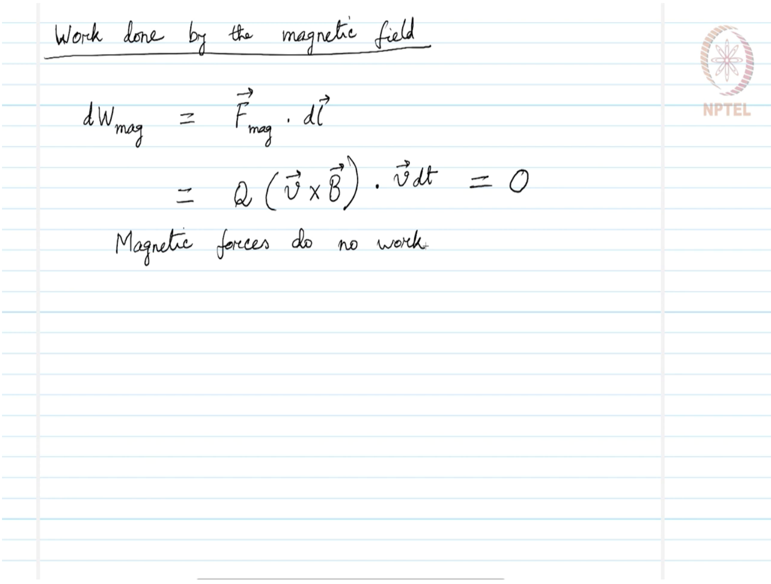

Let us consider in order to make a particle move dl amount a magnetic field magnetic force F mag had to perform a work d W mag. So, d W mag would be the magnetic force dot dl and this is equal to. So, let us write down the expression for magnetic field for a point charge Q; moving with velocity v, this is the expression of the magnetic force. And dl can be expressed as v times dt, v is the velocity of this particle and a dot product.

Now, if we take a dot product like this; that means, v cross B is going to be perpendicular to be to v. And we are taking a dot product of something perpendicular to v with v and that is going to give us 0 for sure. And, if that happens then we can conclude clearly from this and consideration that magnetic fields, magnetic forces do no work. What does it mean? We have accelerated the particle along certain direction, how come that does not do any work, but that acceleration was never along the direction of the force. It is always perpendicular to the direction of force and therefore, it cannot perform any work.