Advanced Dynamics
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Lecture – 51
Hamilton's Principle and Lagrange's Equation of Motion – IV

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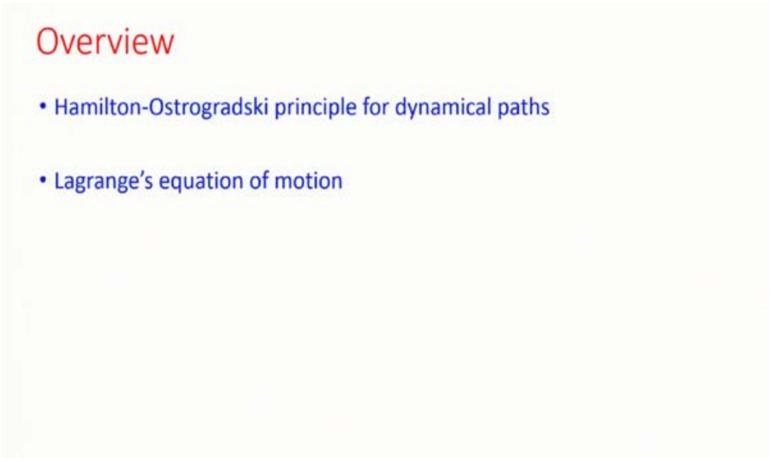

In this lecture, we are going to continue with our discussions on Hamilton-Ostrogradski principle which we had started off in our previous lecture. We are going to discuss further on Hamilton-Ostrogradski principle for dynamical paths and look at deriving the equations with external forces.

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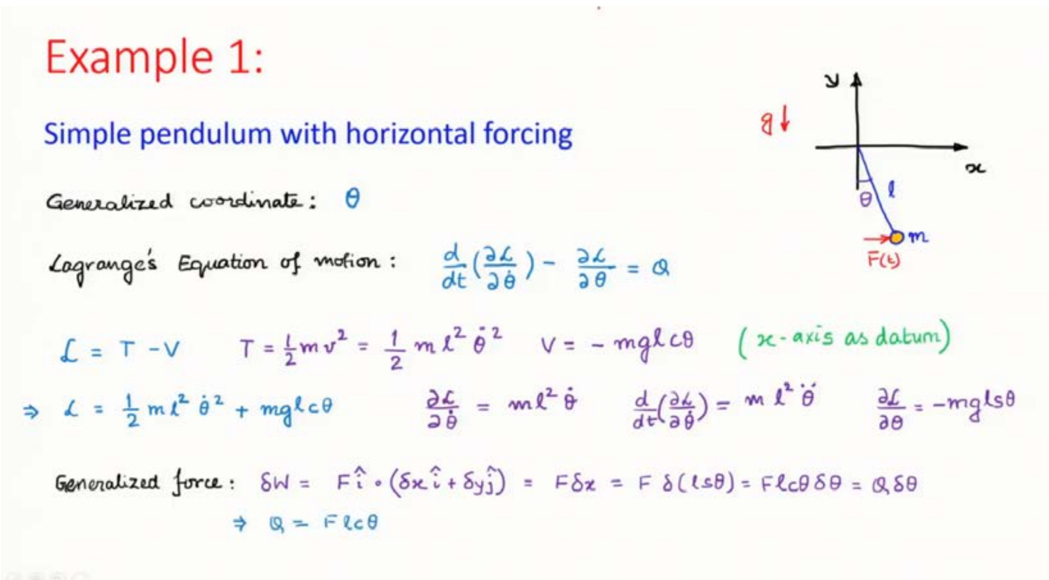

We start with an example of a simple pendulum with horizontal forcing as shown in the above slide The generalized force on the system is derived above.

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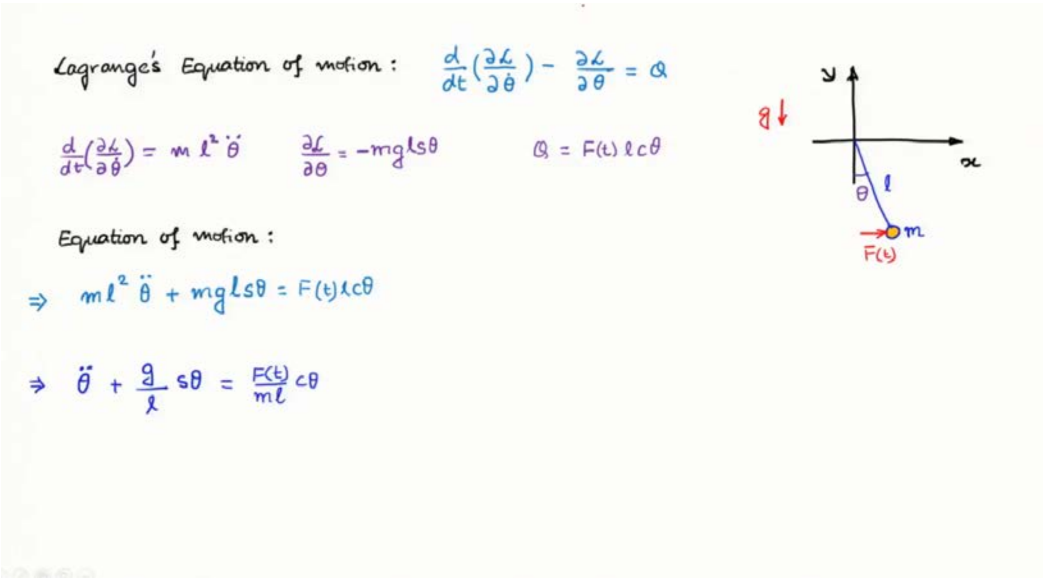

Finally, we obtain the equation as presented above.

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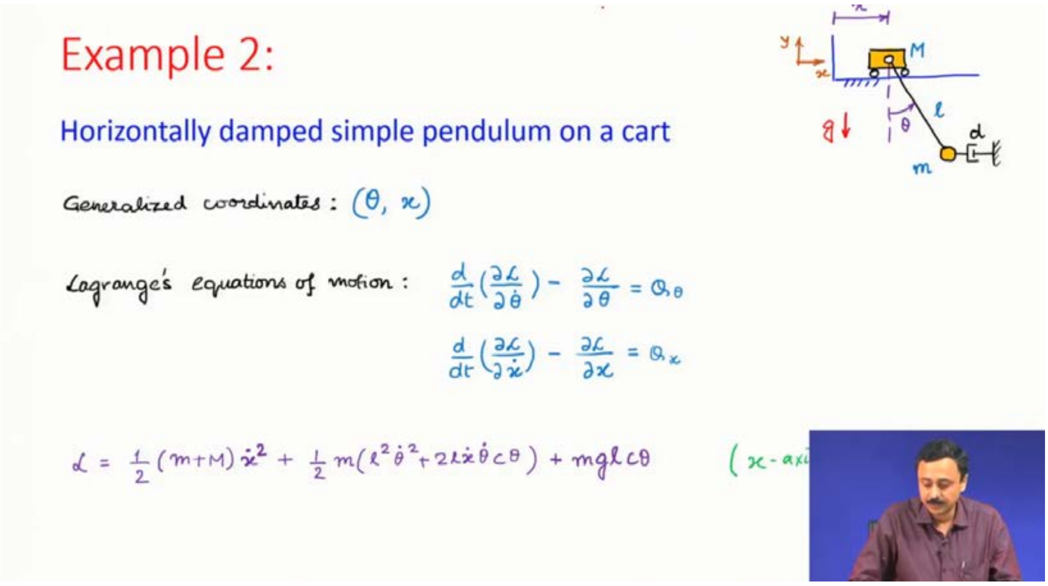

We move to the next example. Here we have a pendulum on a cart and the bob of the pendulum is connected to a viscous dashpot.

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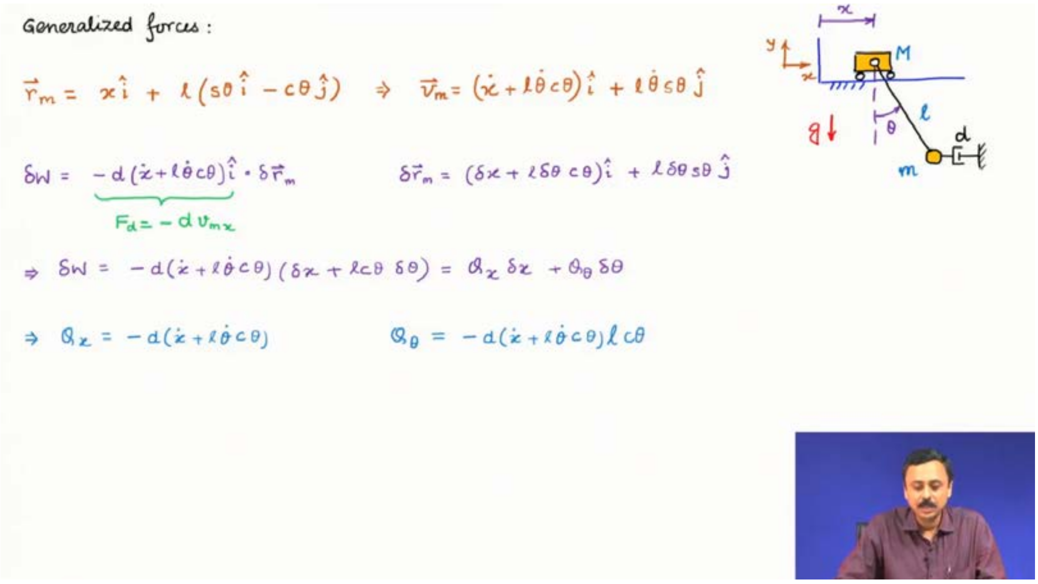

The generalized forces are obtained in the above slide.

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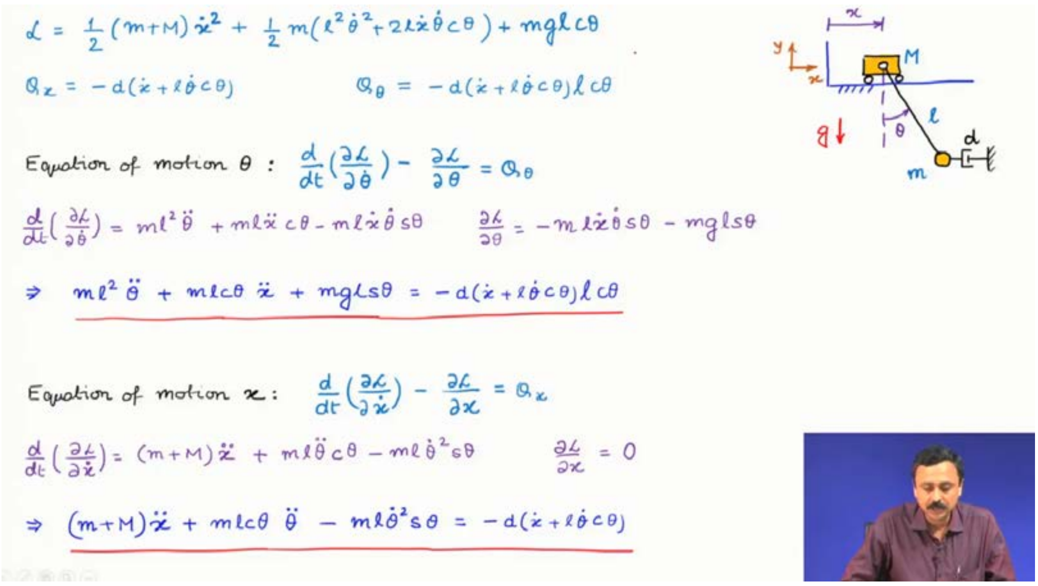

The equations of motion are derived in the above slide.

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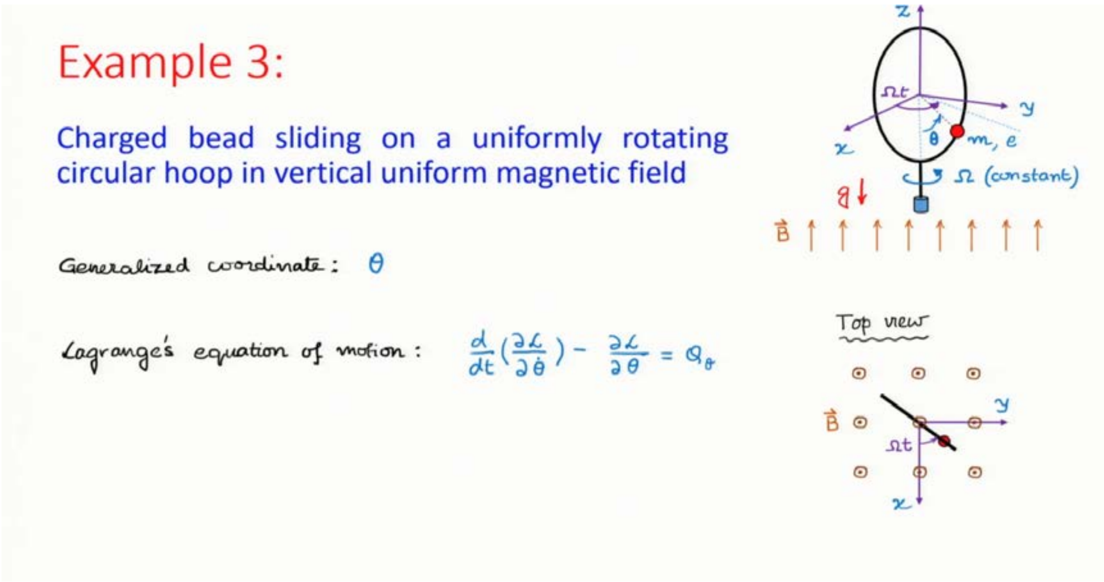

Next, we consider a charged bead sliding on a hoop which is rotating, as shown in the slide above.

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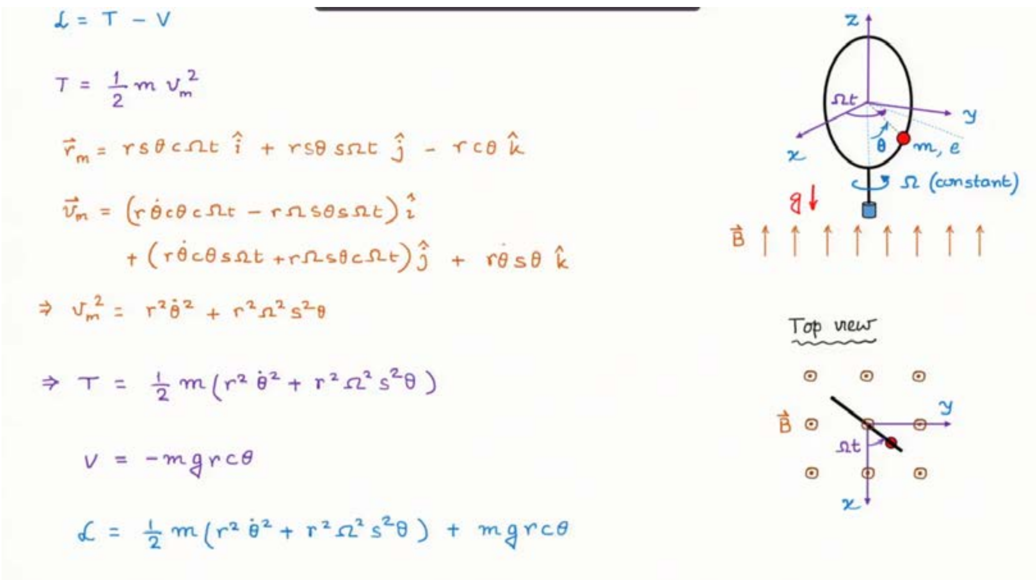

The Lagrangian is presented above.

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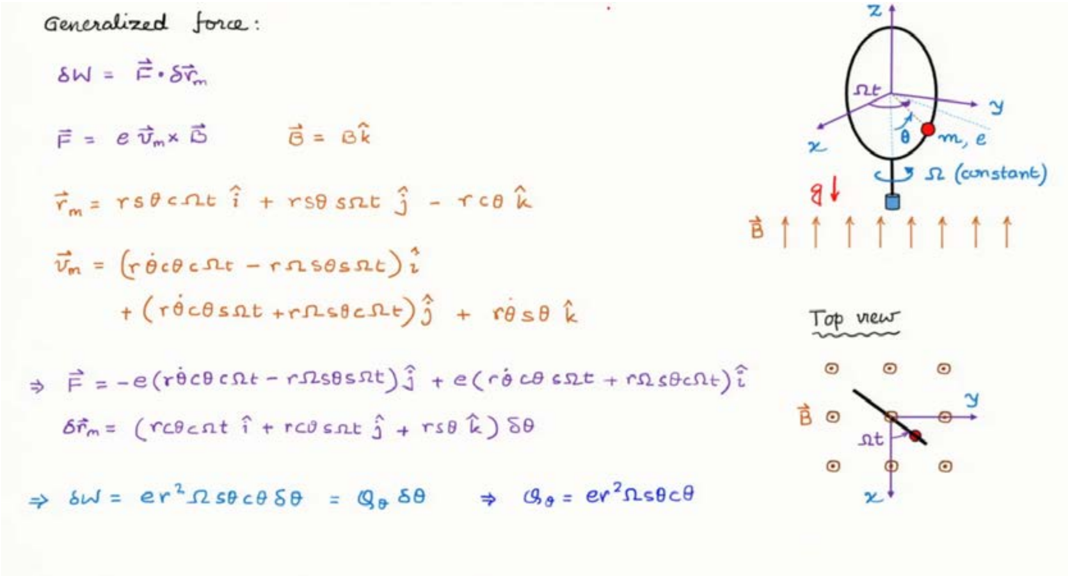

Using the Lorentz force, we determine the virtual work and obtain the generalized force on the bead.

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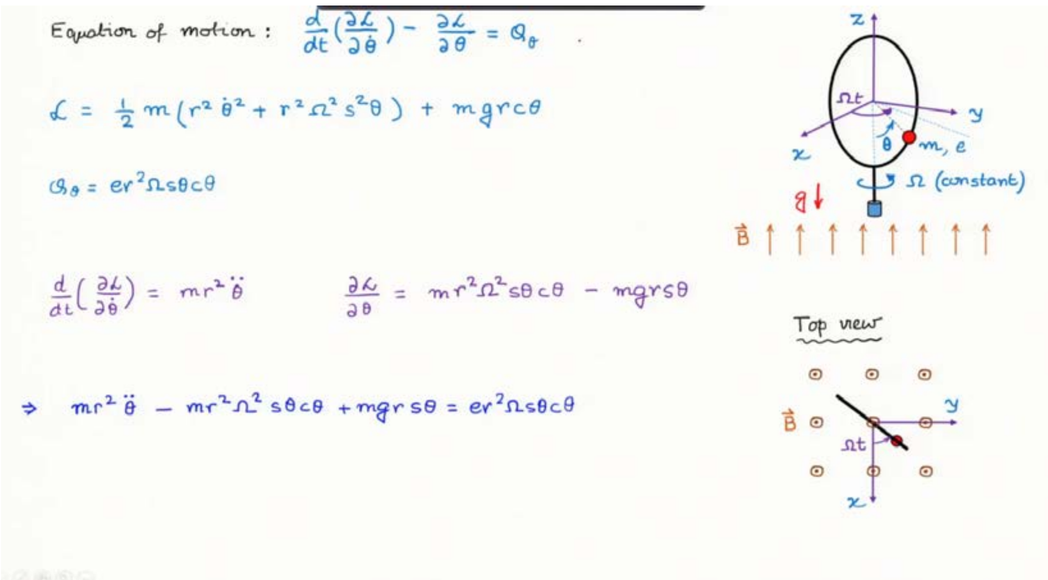

The equation of motion of the bead are then obtained as presented above.

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