Advanced Dynamics
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Module No # 10
Lecture No # 48
Hamilton's Principle and Lagrange's Equation of Motion – I

In this lecture I am going to start discussions on the formulation of dynamics as formulated by Lagrange.

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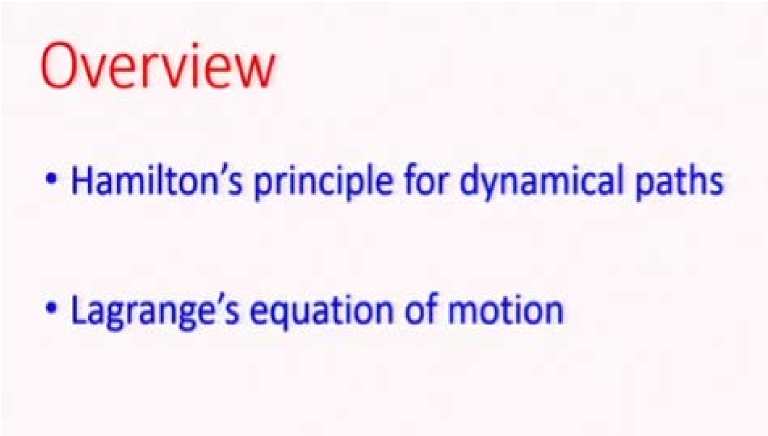

We will start with the Hamilton's principle which is a very important principle, and is the starting point.

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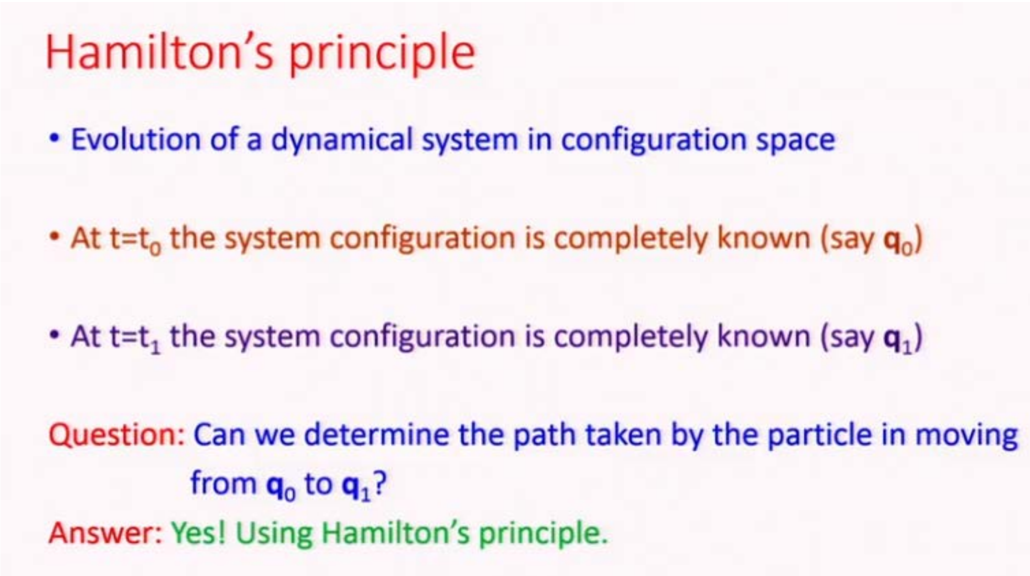

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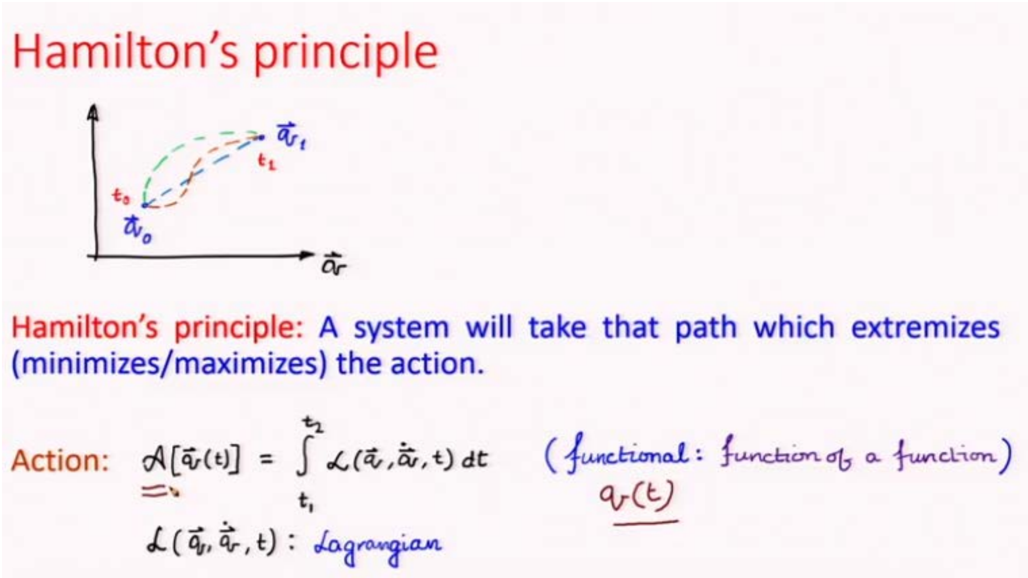

Hamilton's principle is stated above.

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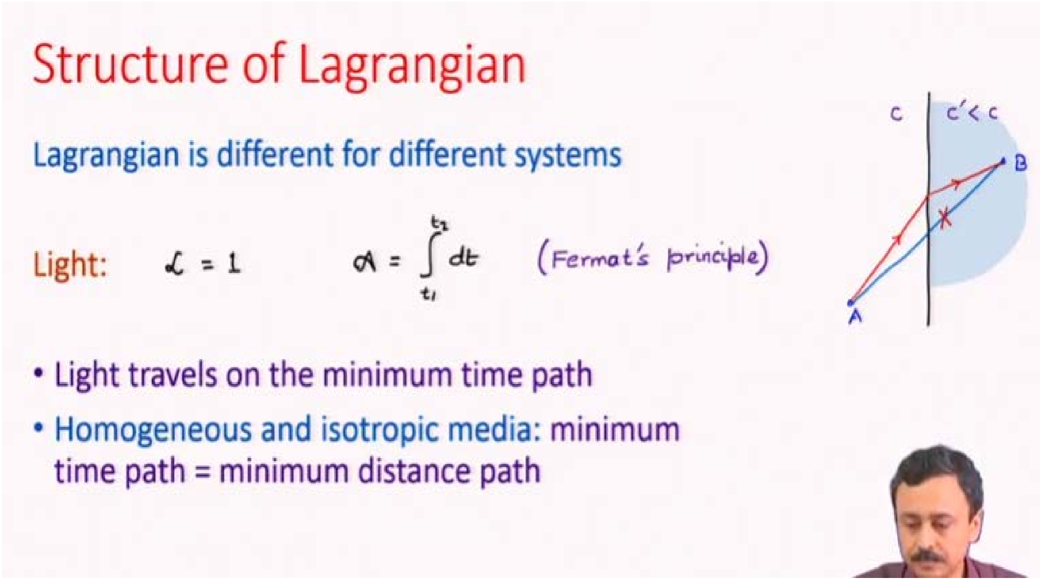

The idea of Hamilton's principle as an extremizing principle for dynamical systems is motivated by Fermat's principle for light.

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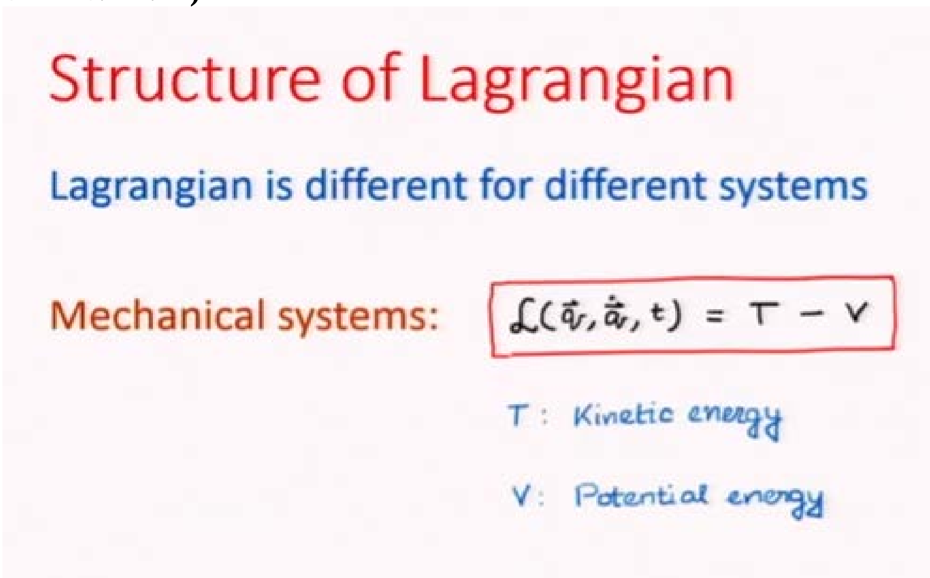

For a mechanical system, Lagrangian is equal to the kinetic energy minus the potential energy.

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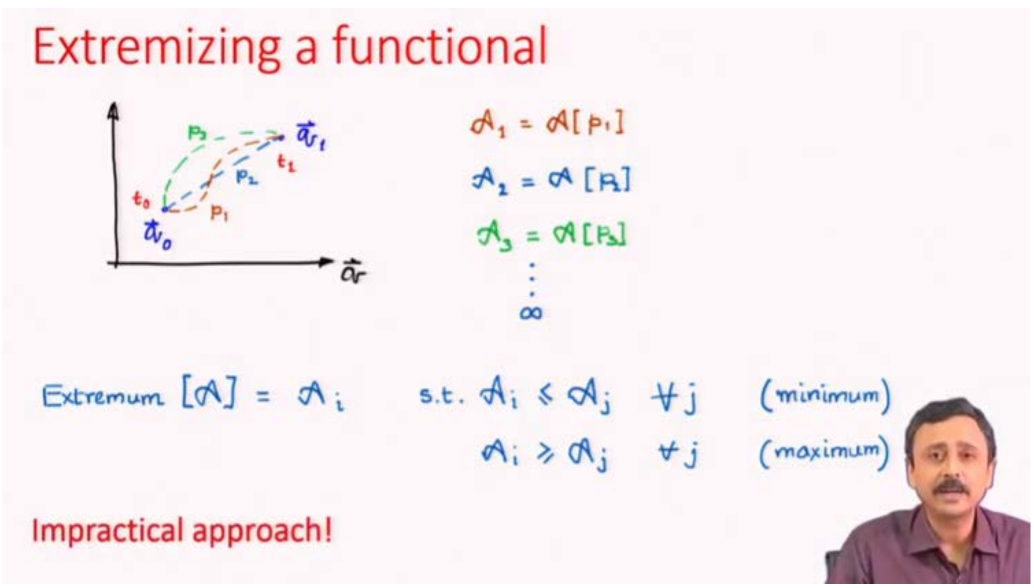

Now we discuss a little bit about how we extremize a functional, as shown above.

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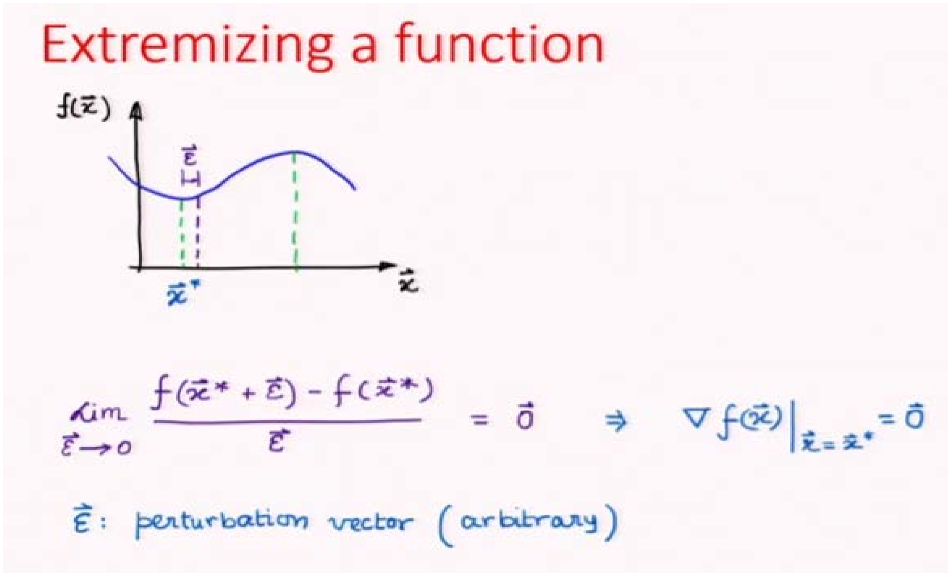

Let us go back a little bit and look at how we extermize a function. This is discussed in the slide above.

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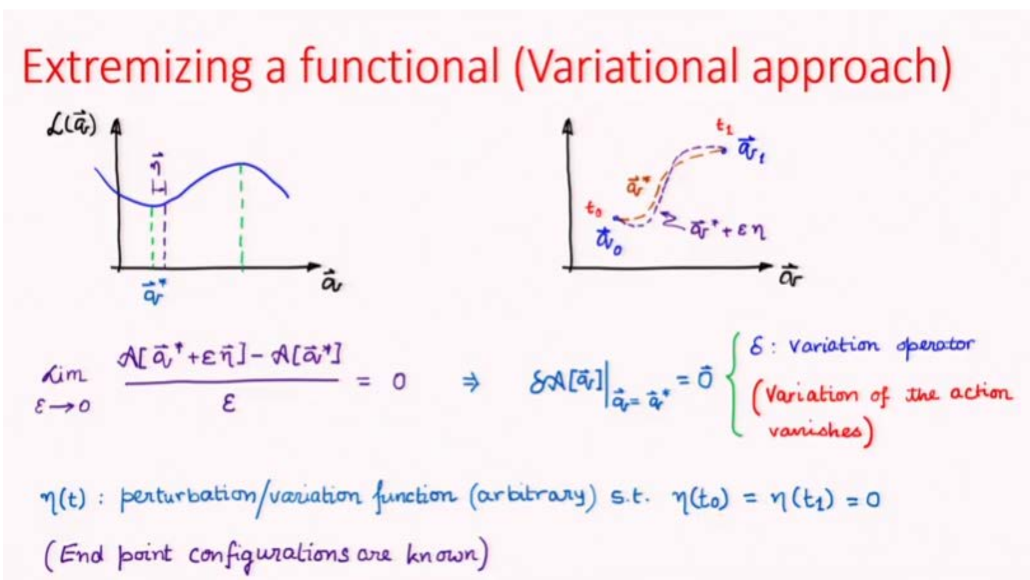

Now we come back to our problem of extremizing a functional, as discussed above.

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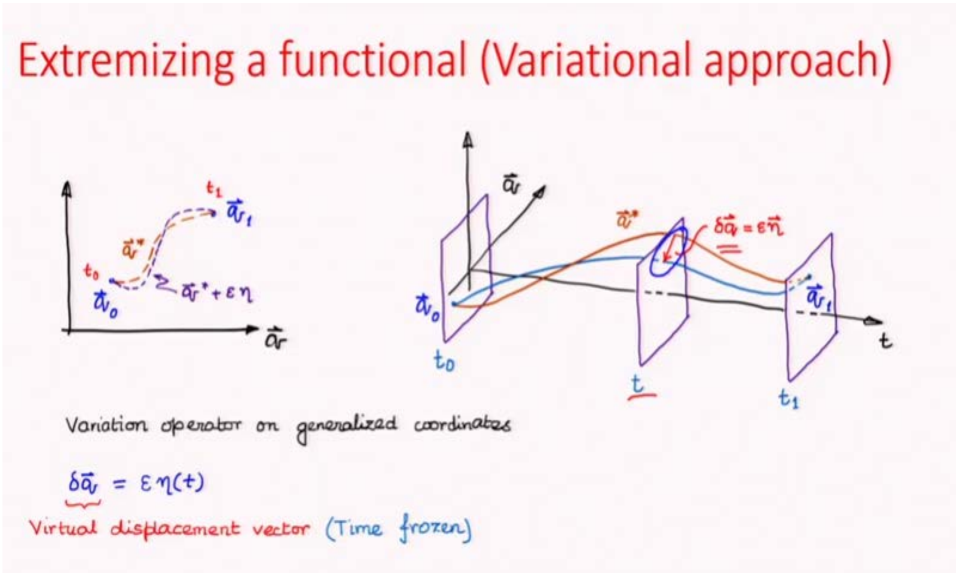

We can also visualize variation in the configuration space as shown above.

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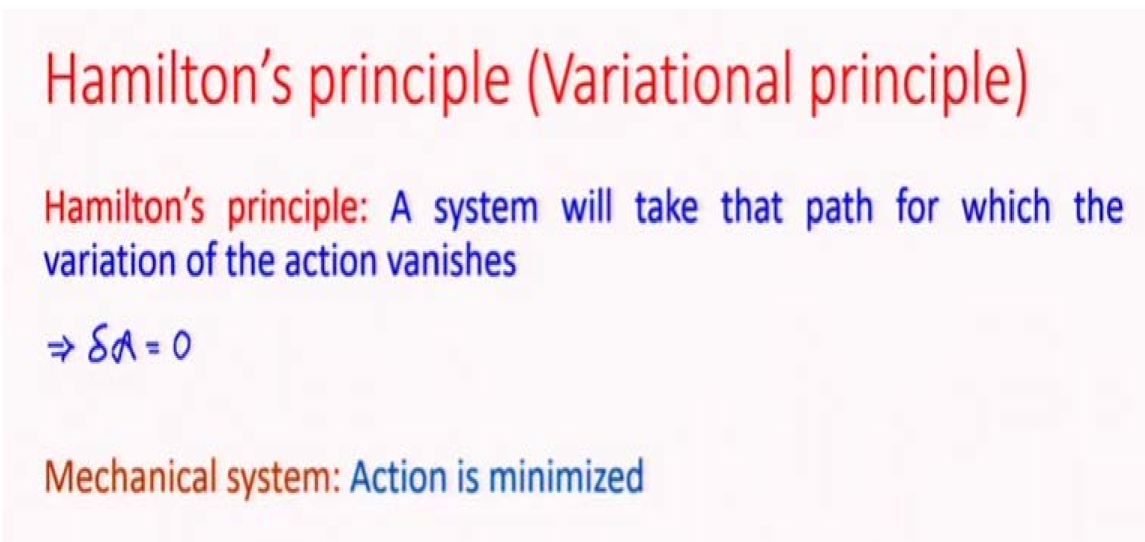

We come back to Hamilton's principle once again. It says the system will take that path in the configuration space for which the variation of the action vanishes.

In the following 2 slides, we discuss the derivation of Lagrange's equation of motion.

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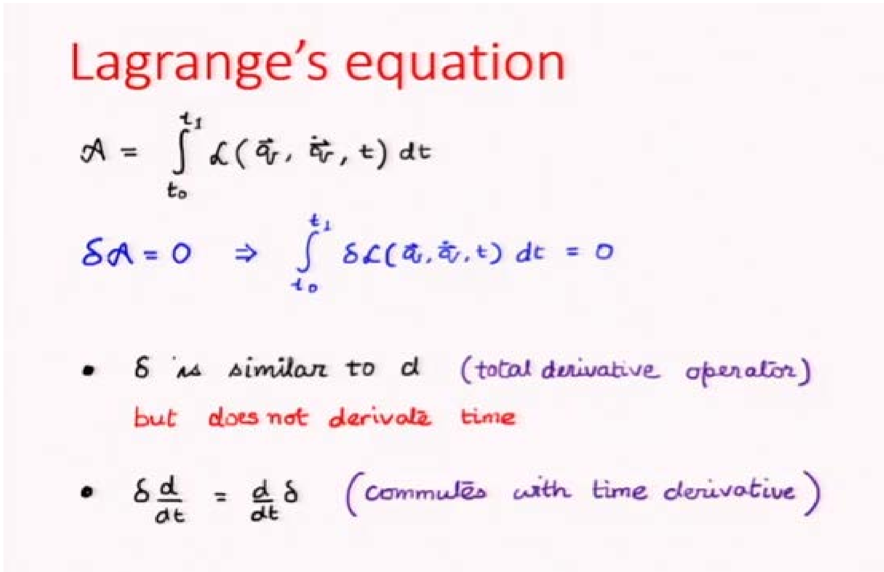

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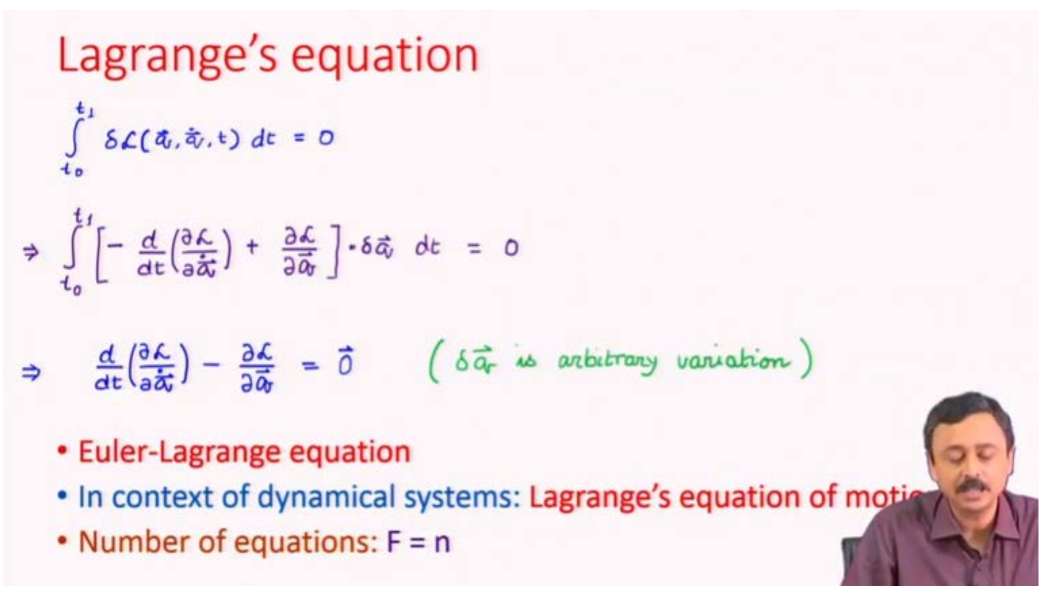

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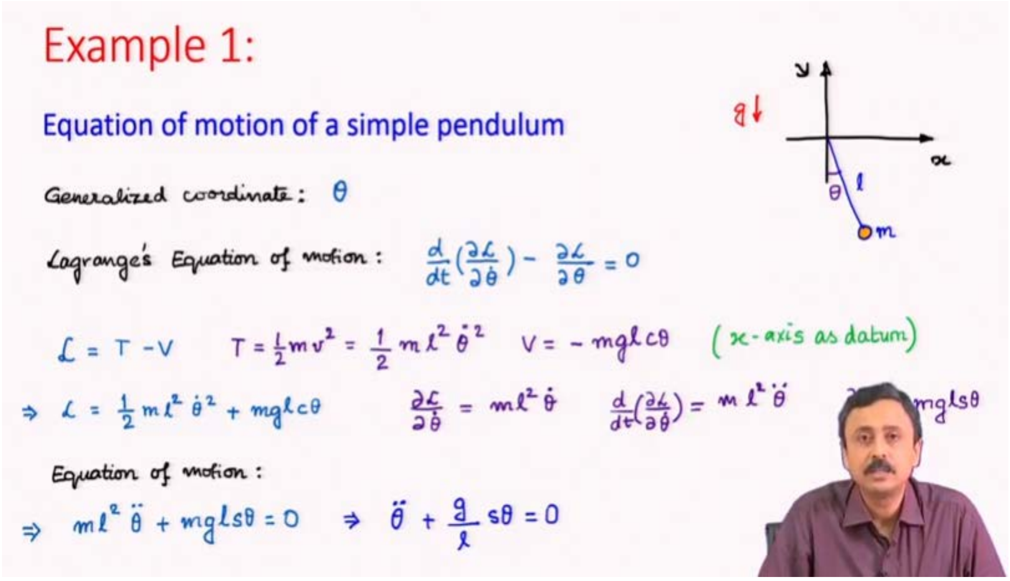

As an example, we will look at the pendulum example equation of motion of a simple pendulum, as presented in the slide above.

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