Advanced Dynamics
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Lecture – 52
System with Constraints – I

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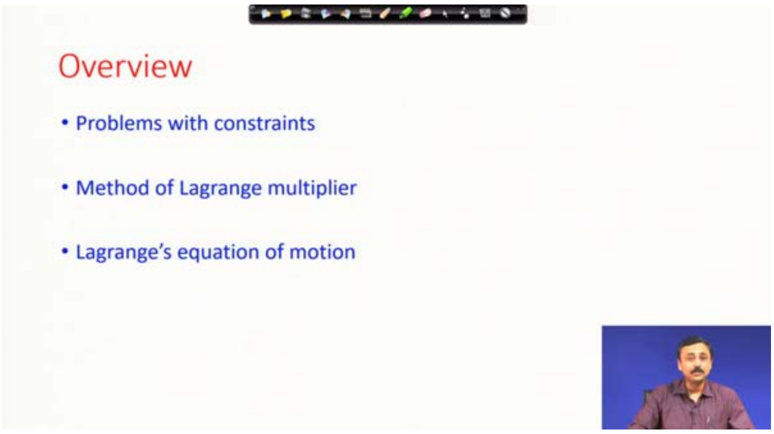

In this lecture, we are going to discuss systems with constraints. We are going to look at the method of Lagrange multipliers and derive the equation of motion in that scenario.

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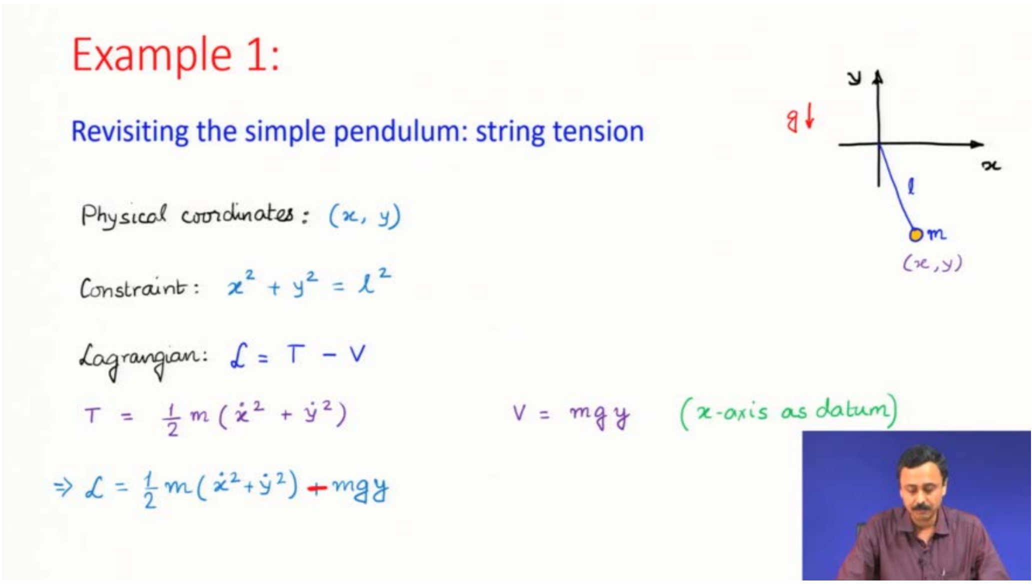

We revisit the example of a pendulum and treat it as a constrained problem as defined in the slide above.

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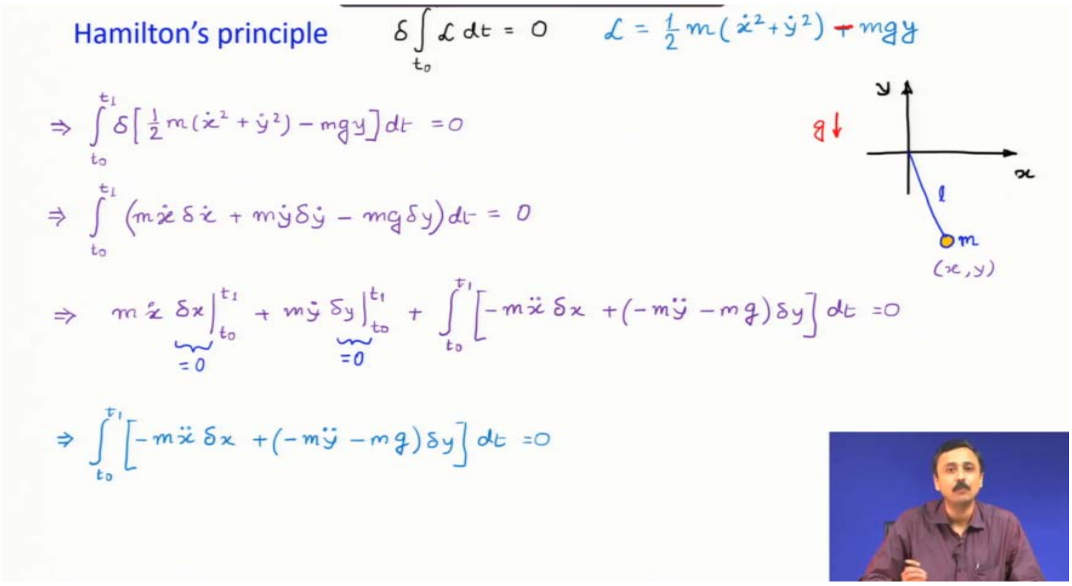

We obtain the variation of the action as presented above. However, the variation of the two coordinates chosen are not independent due to the constraint, as noted in the slide below.

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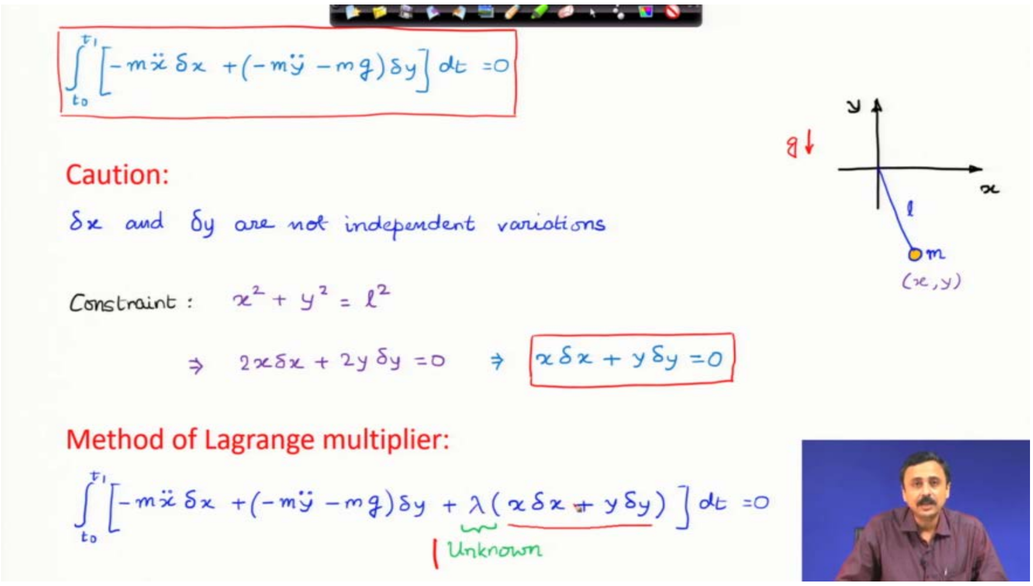

We introduce the variation of the constraint using the Lagrange multiplier as demonstrated in the slide above.

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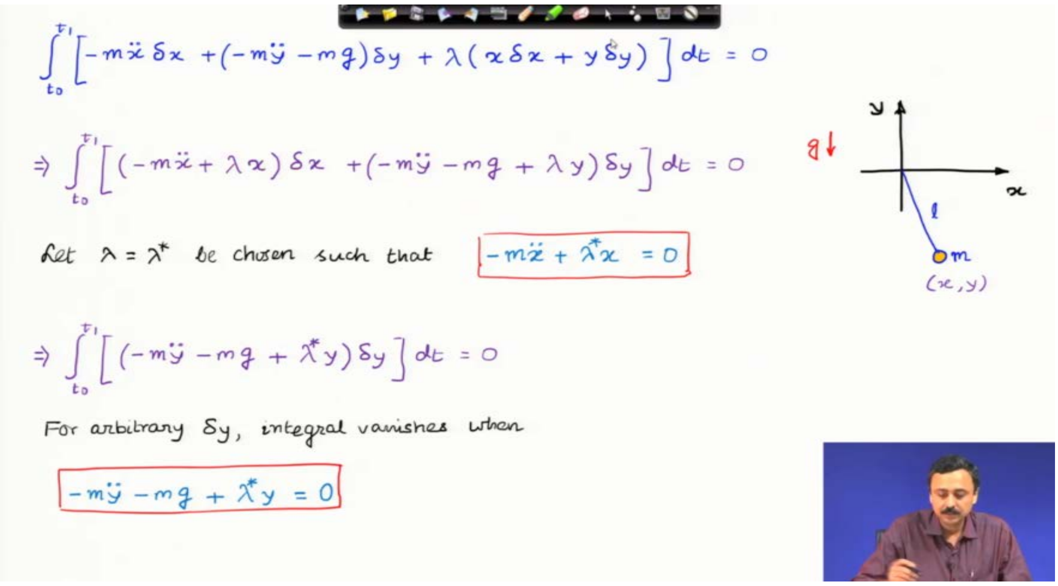

Using the Lagrange multiplier as an additional handle, we can now obtain the equations of motion as discussed in the slide above. However, the equations involve the unknown Lagrange multipliers.

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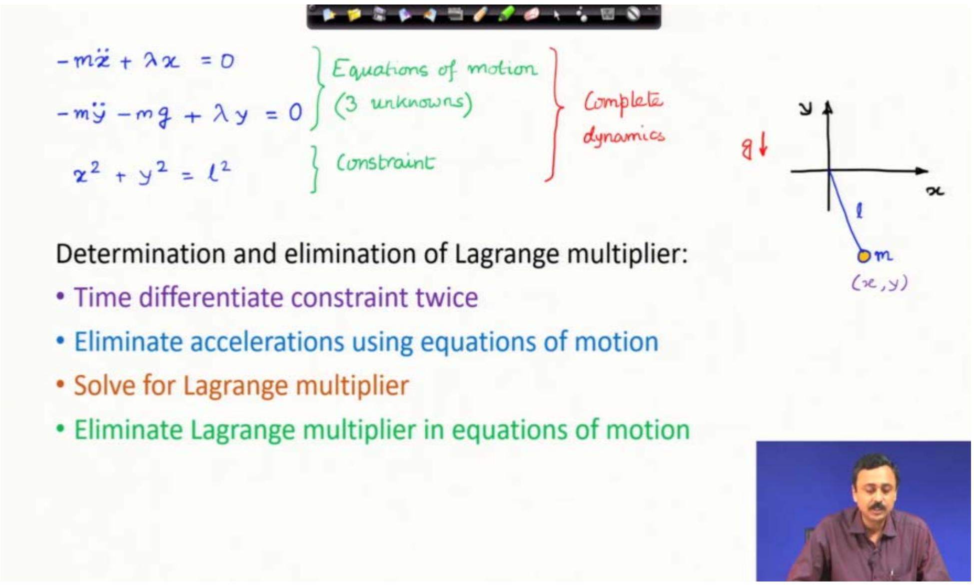

Finally, the steps to eliminate the Lagrange multiplier is presented in the slide above.

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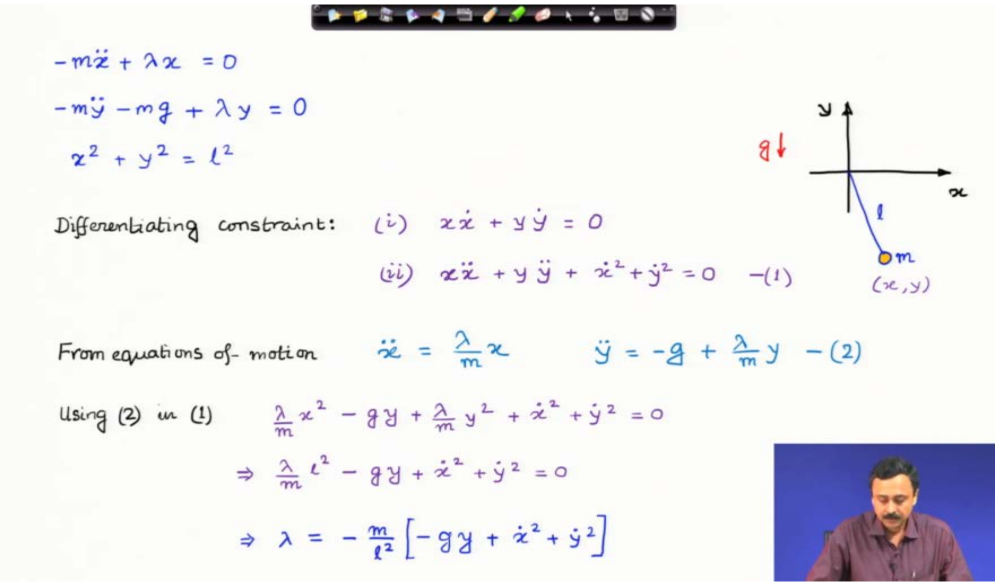

The Lagrange multiplier can be obtained as detailed above.

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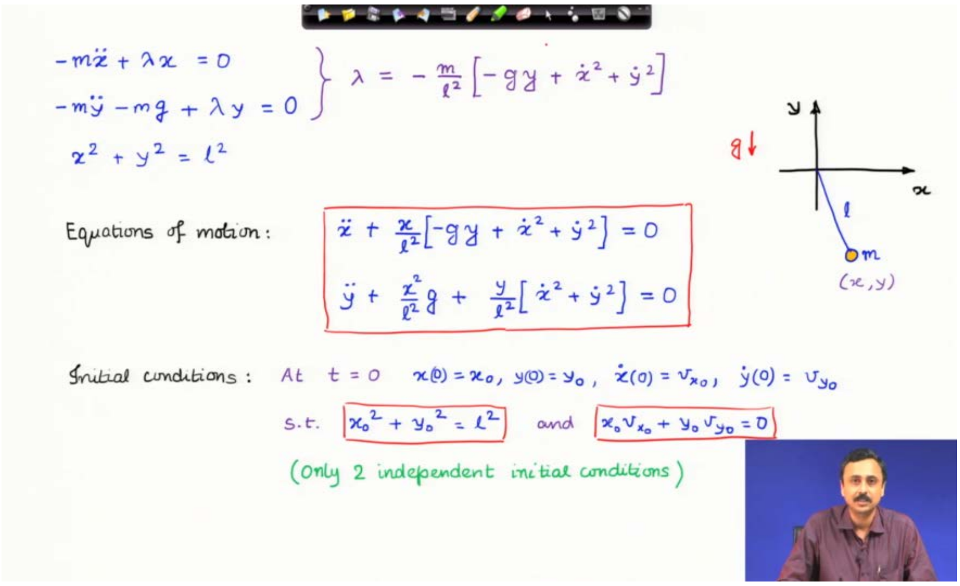

Next, we eliminate the Lagrange multiplier as shown above. The initial conditions are also discussed.

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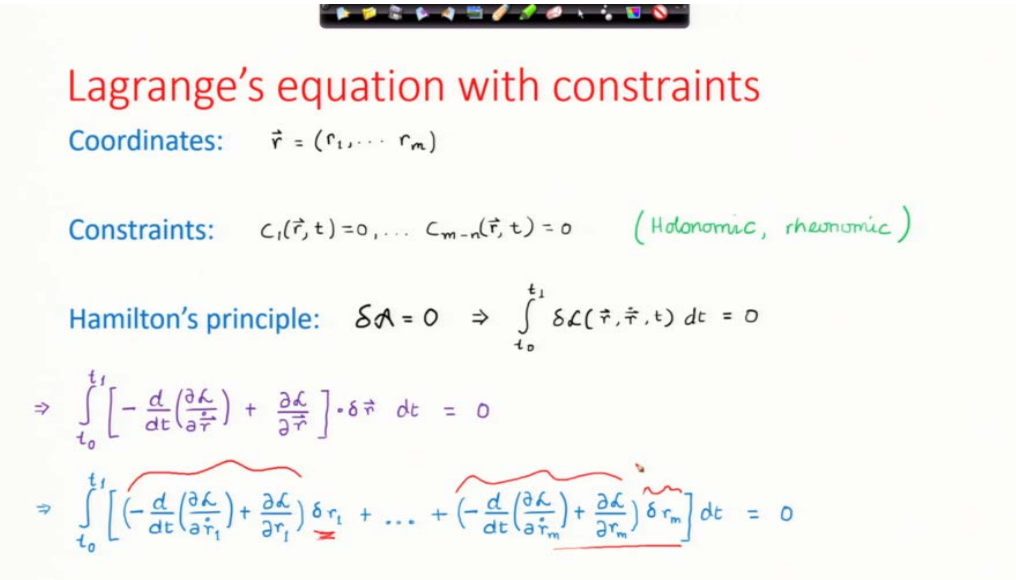

Now, we generalize this approach as discussed in the following 3 slides.

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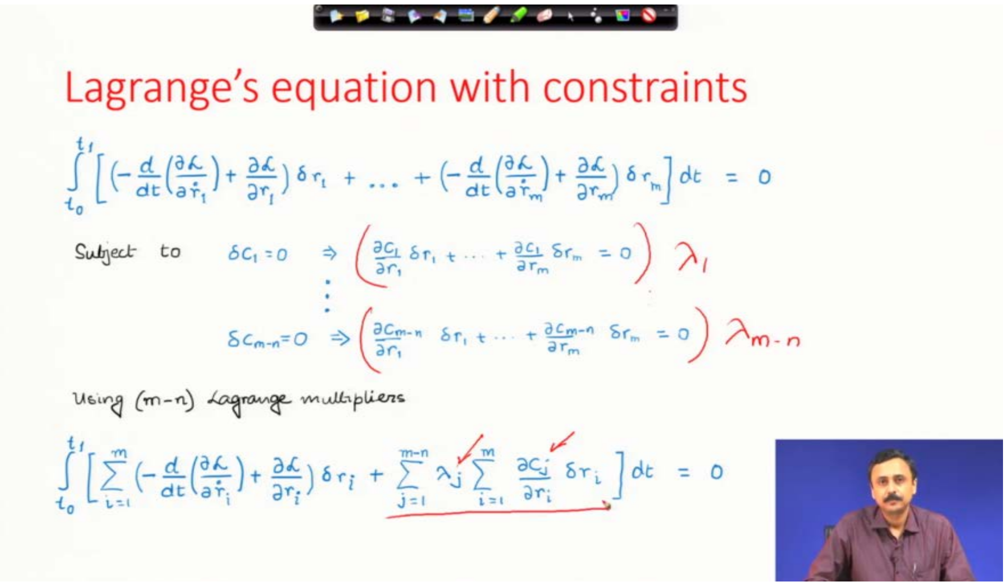

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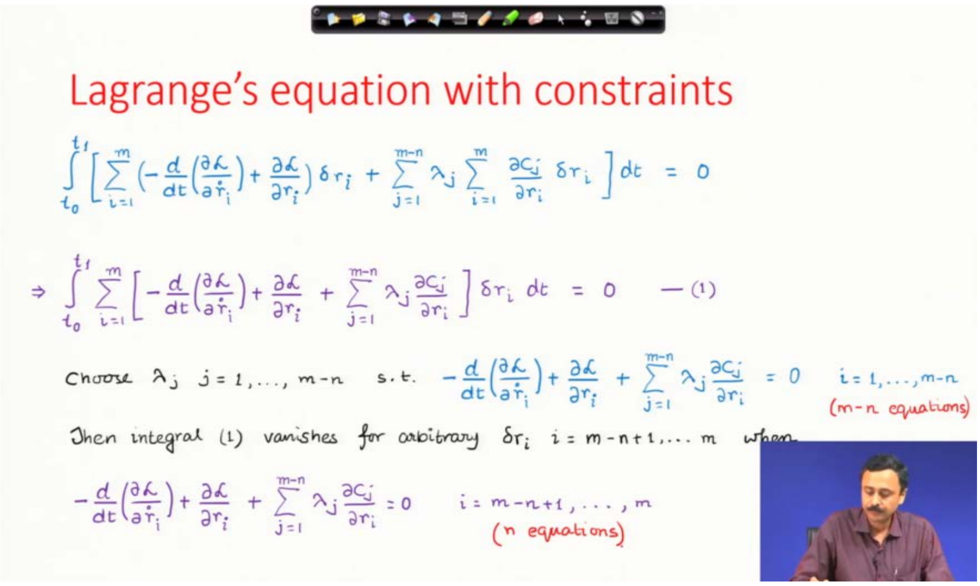

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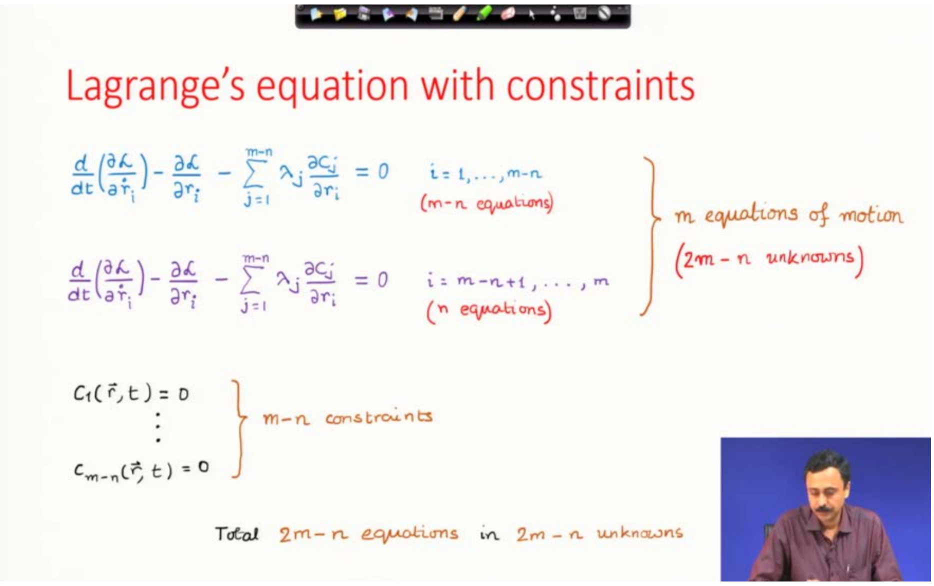

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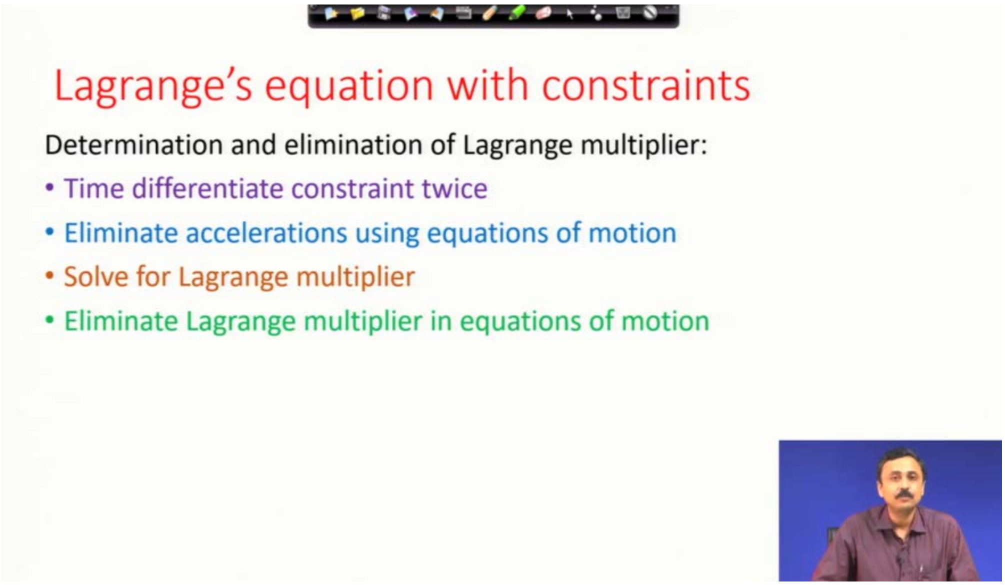

Finally, we follow the steps that we have discussed for determination and elimination of the Lagrange multipliers, as presented above.

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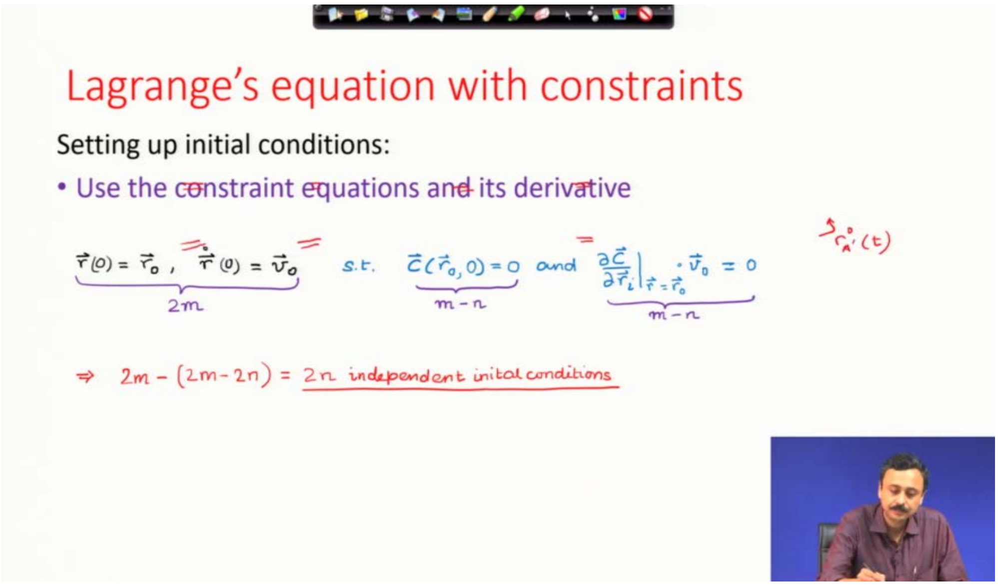

The above slide discusses setting up of the initial conditions for the problem.

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