Computational Electromagnetics and Applications
Professor Krish Sankaran
Indian Institute of Technology Bombay
Summary of Week 5

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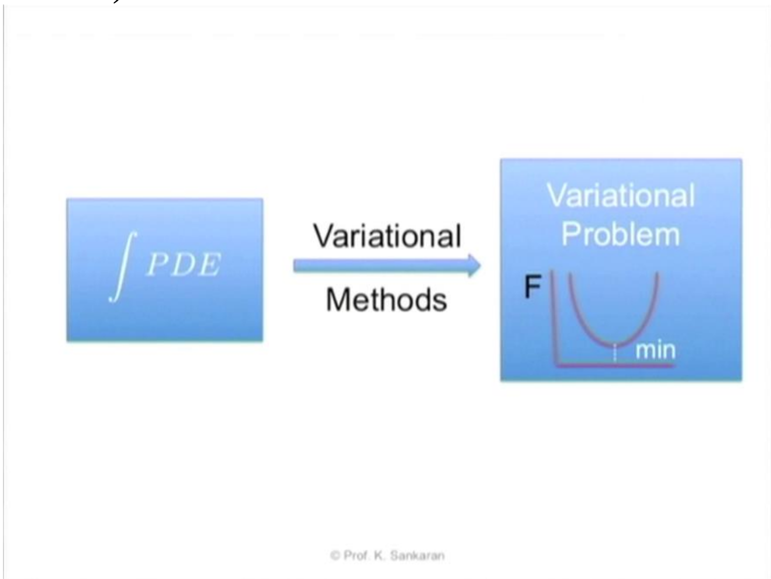

We introduced the basic theory behind variational methods starting from the concept of variational principle.

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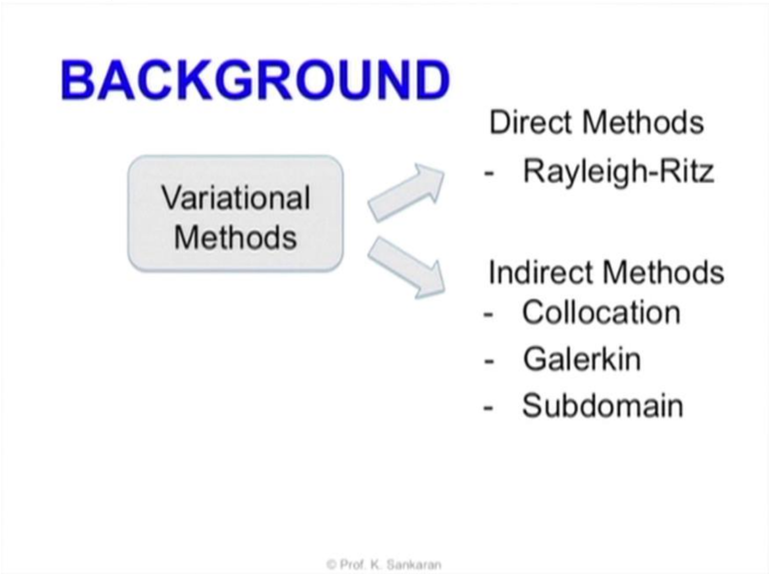

We discussed two broad categories of variational method namely the direct and indirect variational methods.

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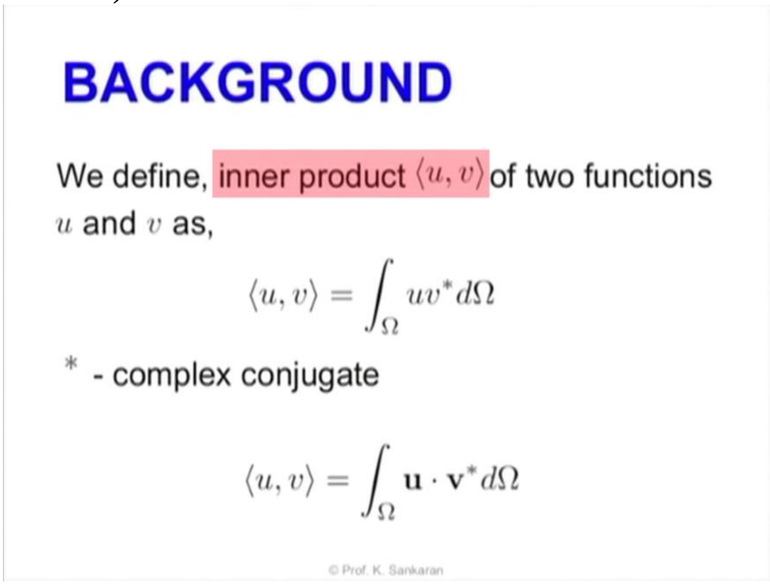

We explained a physical and mathematical interpretations of inner product that we commonly used in variational methods and discussed some of its properties.

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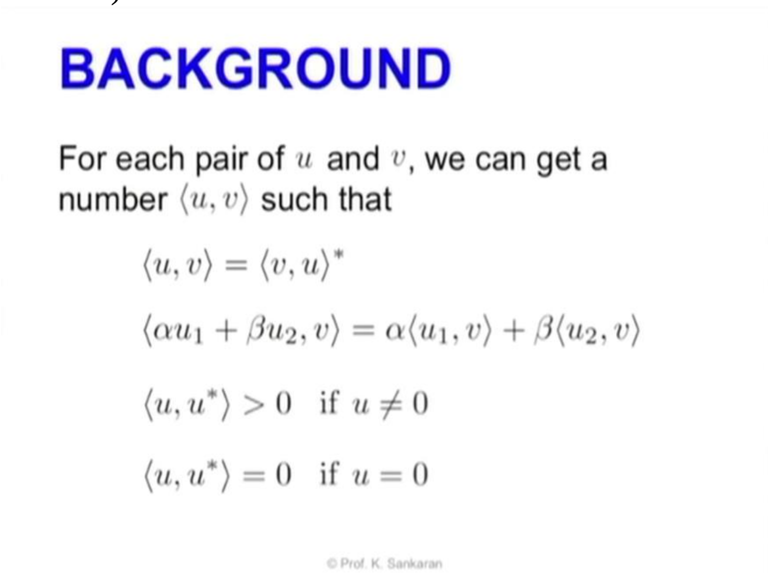

We have also introduced the concept of action integral.

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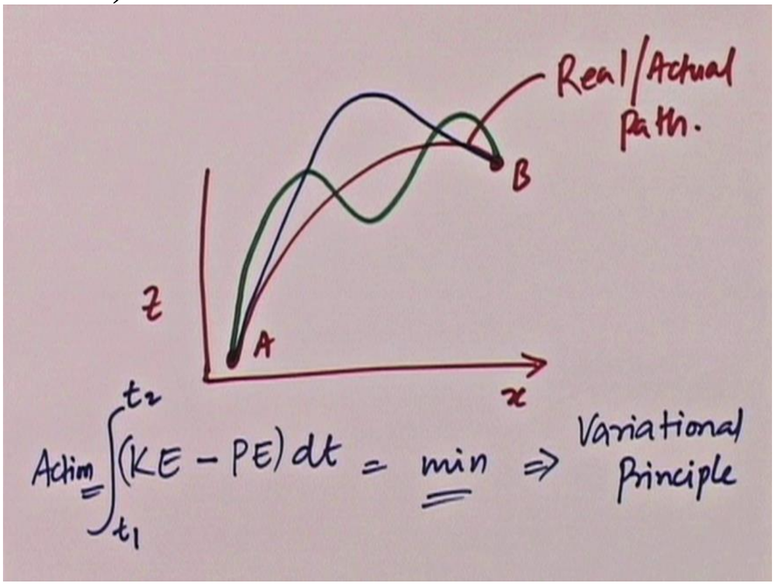

We introduced the calculus of variations giving a simple example of throwing a stone in the air.

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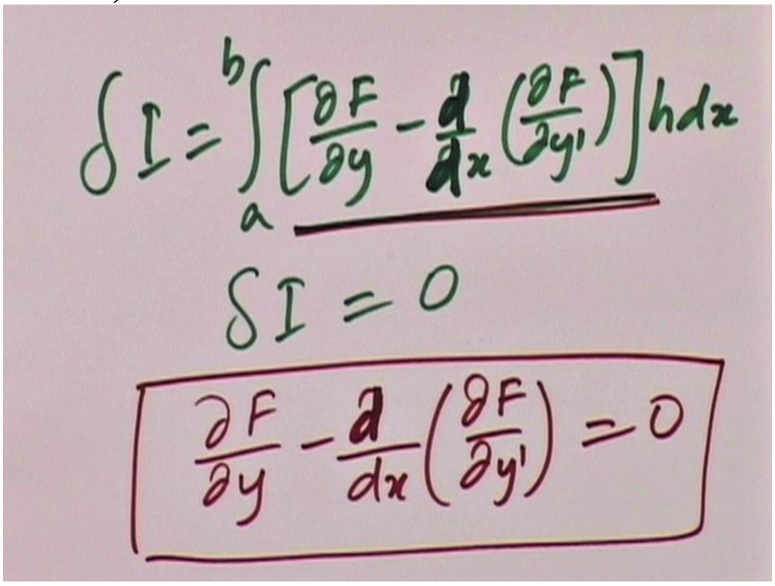

We discussed the steps for deriving the partial differential equation for a given variational principle.

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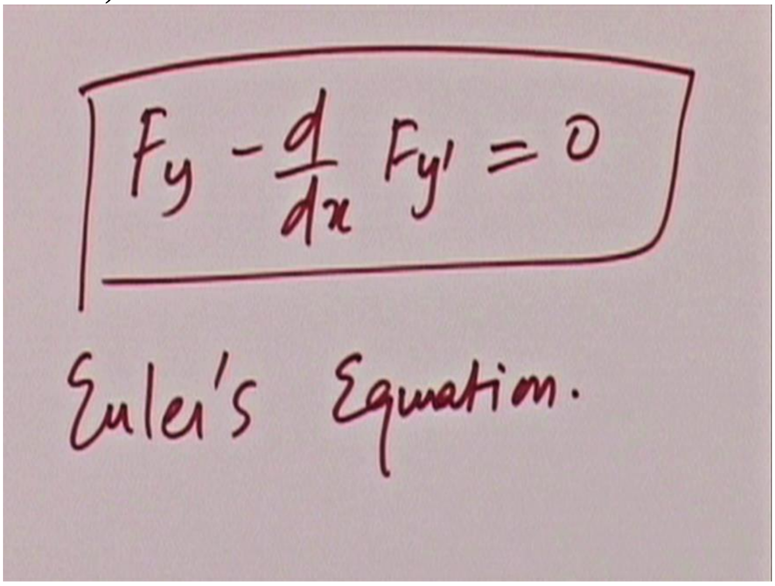

We have also discussed how one can derive the Euler equation for a given partial differential equation.

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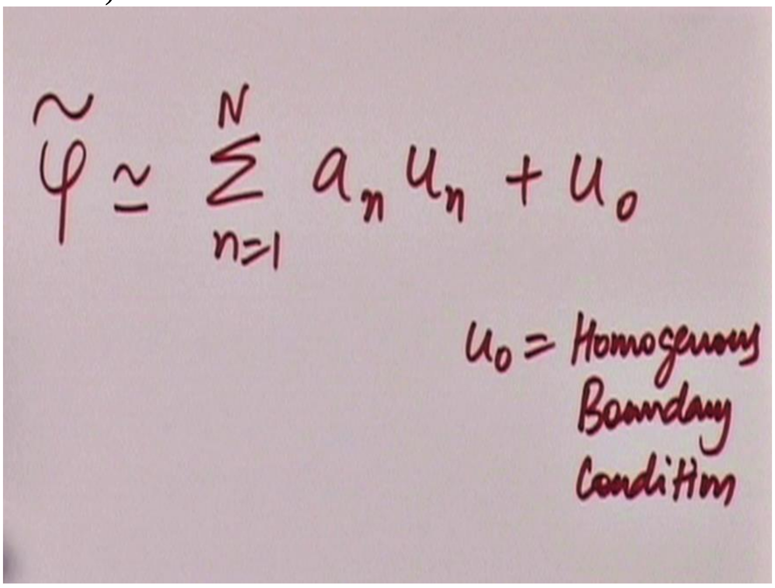

Later we explained how we can approximate any unknown function using a set of known basis functions.

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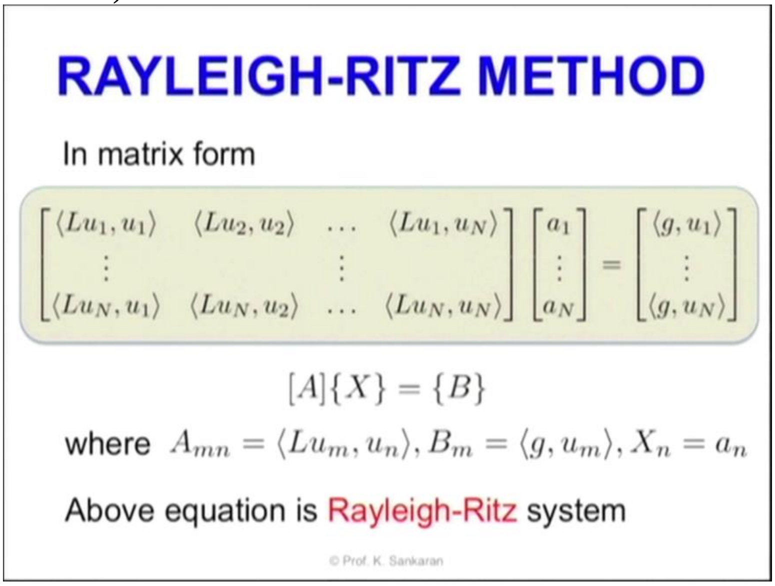

Under direct variational method we discussed the mathematical formulation of the famous Rayleigh Ritz method.

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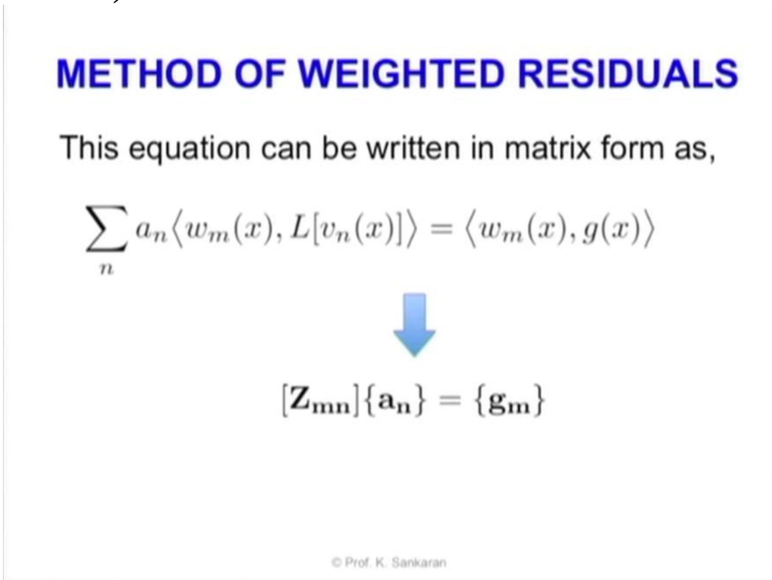

Under the indirect method we introduced the Weighted Residuals

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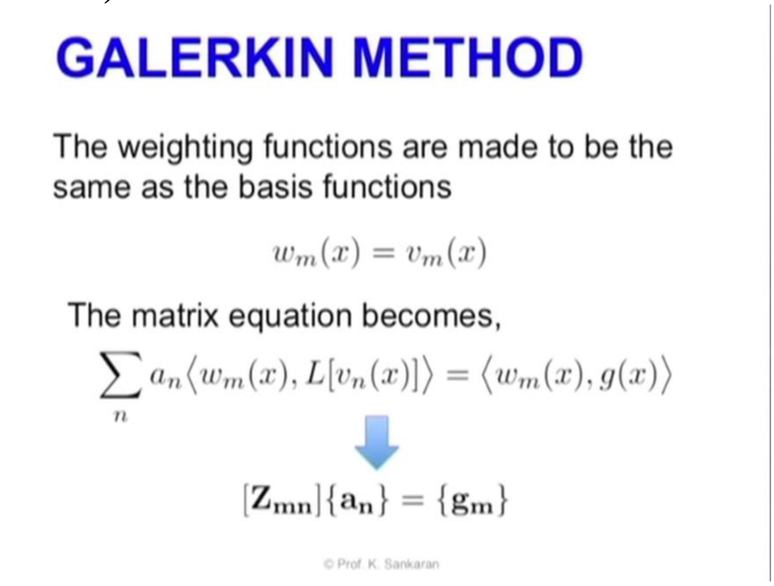

And Galerkin Method. These techniques form the basis for two of the most important computational techniques namely the finite element method and the method of moments.

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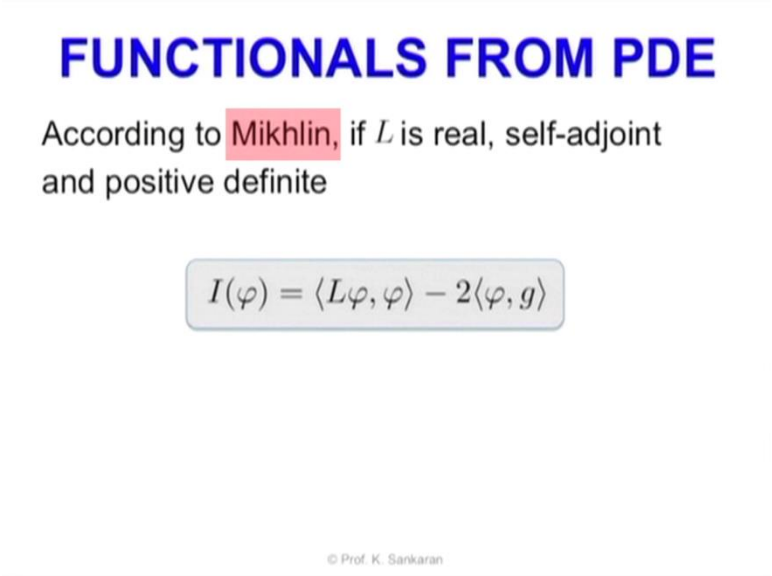

We also discussed how one can directly derive the functional for a given PDE using Mikhlin approach.

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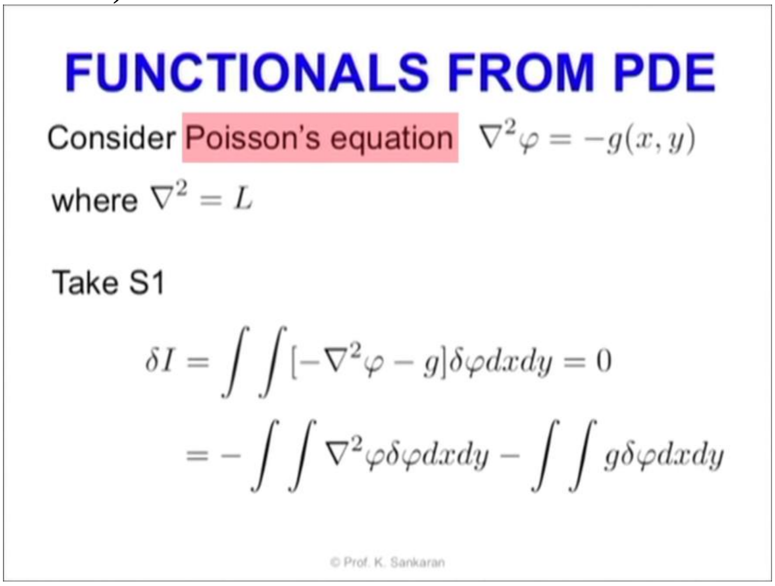

We used these techniques for solving two dimensional Poisson equation mastering

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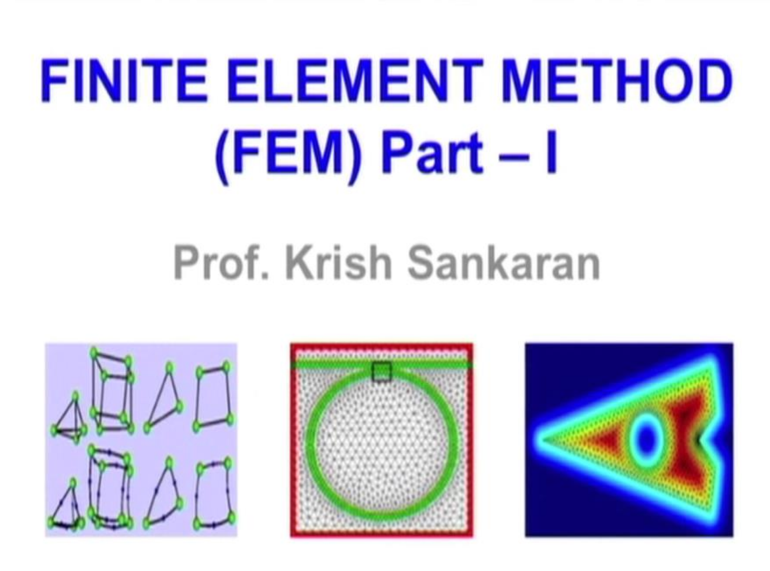

The basics of variational methods are going to be very helpful when we are introducing the finite element method in the next modules.

So please practice diligently the simulations and examples that we have discussed in this week and post you questions on the forum. We will see you next week till then Good Bye!