**Course Name:**Finite Element Method in Electromagnetic

**Description of the lesson (as much as one paragraph):**

In this course, the Maxwell's equations together with the electromagnetic scalar and vector potentials are defined. Solution of the potential differential equations based on the potentials by finite element method is explained. Finally, determination of physical parameters of the problem is carried out.

**Course Syllabus:**

Mathematics Involved

- Partial Differential Equations of physical phenomena; Maxwell Equations
- Solution of Differential Equation in variational formulation.
- Base Function
- Differential Methods of Integral Forms
- Euler-Lagrange Equations
- Weighted Residuals
- Collocation Method
- Sub domain Method
- Least square Method
- Galerkin Method

Finite Element Method

- One Dimensional Finite Elements
- Two Dimensional Finite Element (Static, Dynamic and Transient Fields)
- Potential Form of the Electrical and magnetic field Equations
- Equations for a single element

- Boundary Conditions

    Internal Boundaries

    External Boundaries

Global Matrix Assembly

Numerical solutions of the Global system Matrix

    Linear & nonlinear methods

Post processing, using the scalar and vector potentials

    Inductance and Resistance Determination

    Force & Torque Determinations

    Eddy currents & Diffusion

Text books:


1. Finite Element in electrical Engineering, By: SILVESTER
2. Electromagnetic Modeling By: FEM, J. PEDRO, A. BASTOS, N. SADOWSKI
3. Electrical Machine Analysis using Finite Elements, By: Nicola Bianchi