

INTRODUCTORY FINITE ELEMENT METHOD

Elective course.

I_ Description:

On completion of this course the student should be familiar with finite element programs in FORTRAN or in C++ language and can use them to solve some simple potential problems.

II_ Prerequisite:

1. Multivariate calculus,
2. Linear algebra
3. Familiarity with FORTRAN or C++

III_ Course contents (90min/week x 14 weeks).

1.
The first boundary problem of potential theory and its theoretical solution.
Using computers to plot regularly spaced coordinate points and giving their coordinates in a table.
2.
Approximate solution to the first boundary value problem.
Plotting line segments joining vertexes of elements.
Labeling the vertexes on graphs.
3.
Listing the vertexes of elements in a table.
Labeling elements and their vertexes on graphs.
4.
Definition of the "stiffness matrix".
Automatic calculation of the stiffness matrix from the list of elements.
5.
Formulating the matrix equation for Finite Element Method.
Method of solution for this matrix equation (1)
6.
Method of solution for this matrix equation (2), continued.
7.
Method of solution for this matrix equation (3), continued.
8.
Interpreting the solution to the matrix equation.
Listing the solutions and plotting them.

9.
Plotting the solution to problems with simple geometry.

10.
The finite element method for more complex geometries.

11-14.
Practice on other examples.

IV_ References:

1. Finite Element Method in Engineering Science (Paperback)
by O.C Zienkiewicz, McGraw-Hill, London.