Mathematical Modeling and Use of FEM on Static Structure

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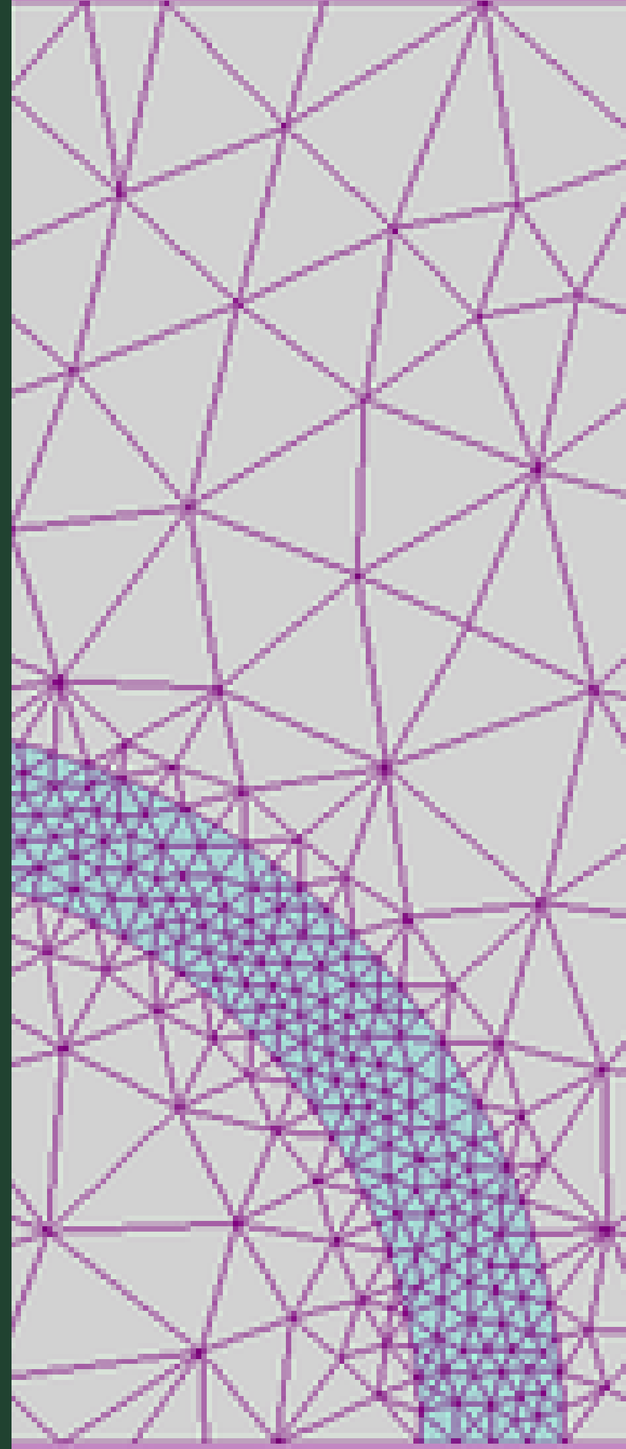

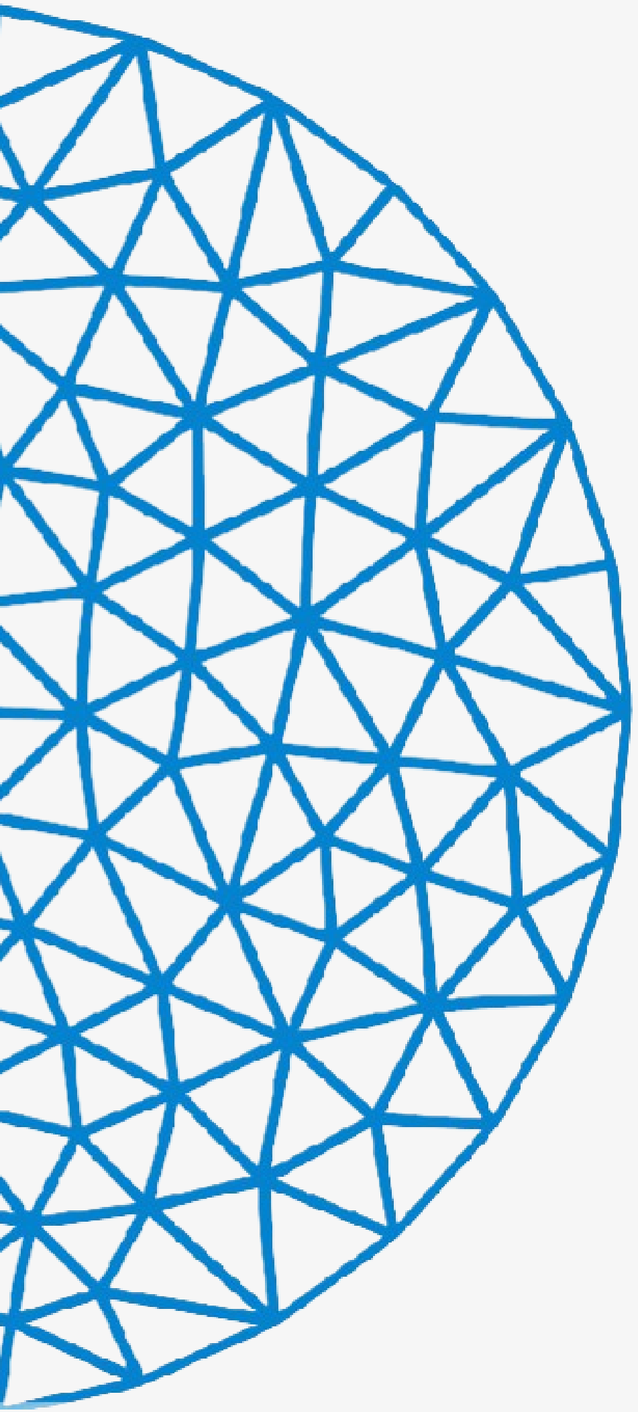

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INTRODUCTION

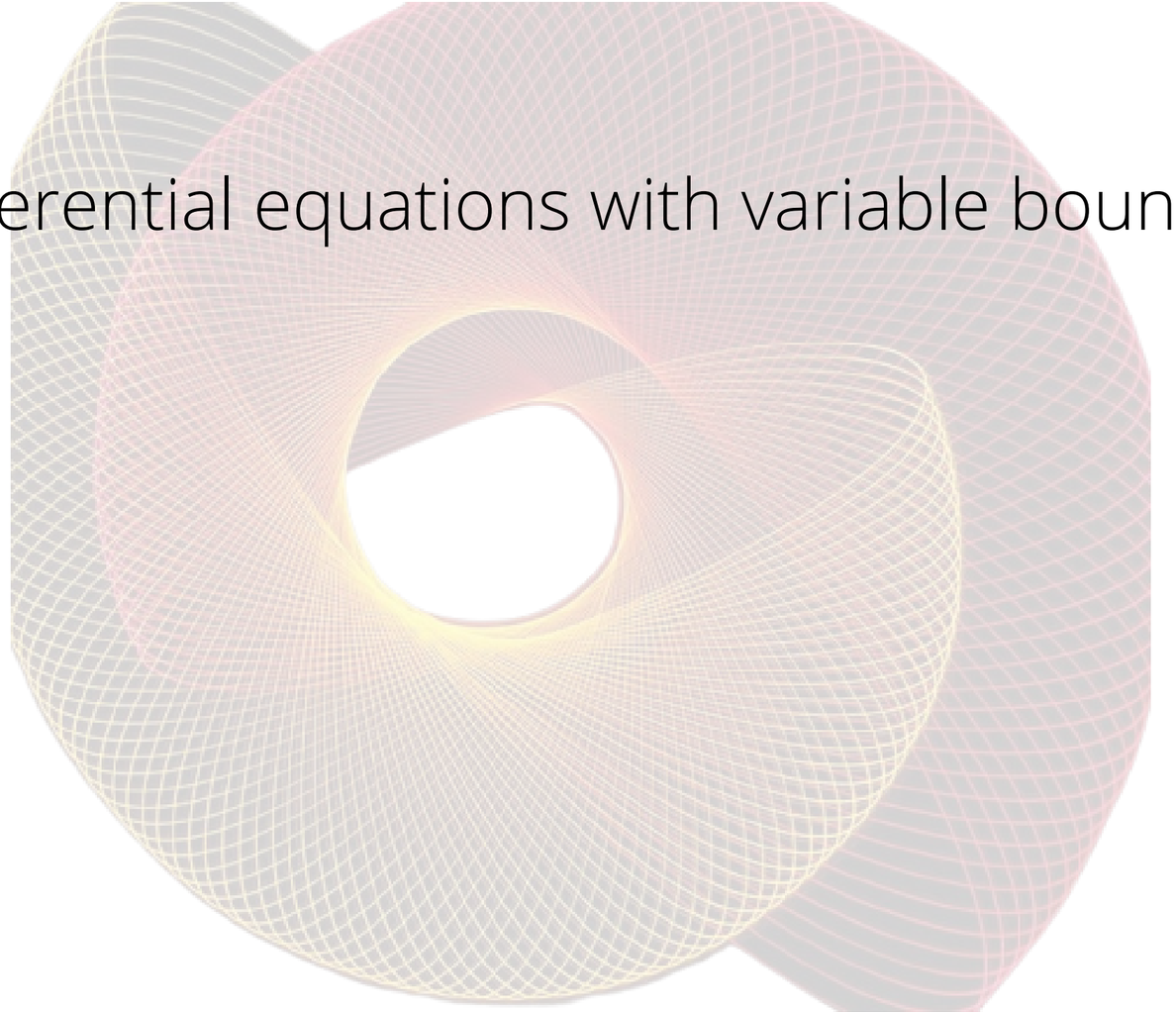
- Finite Element Method (FEM) is a procedure of numerical solution of those equations that control the problem fund in nature.

- FEM on static structures, compute its stress, heat flow under a set of loads.

- The actual problem will be replaced by simpler ones to find one approximate solution.

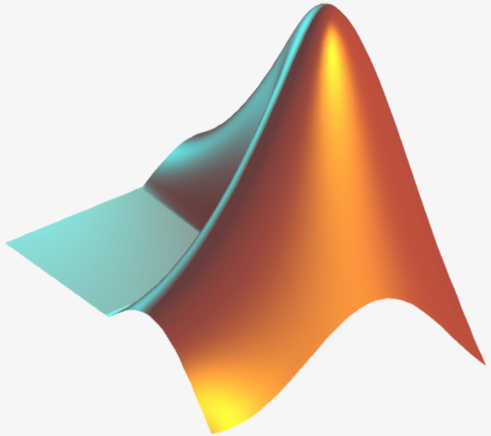
Objectives - I

We set up differential equations with variable boundary conditions.



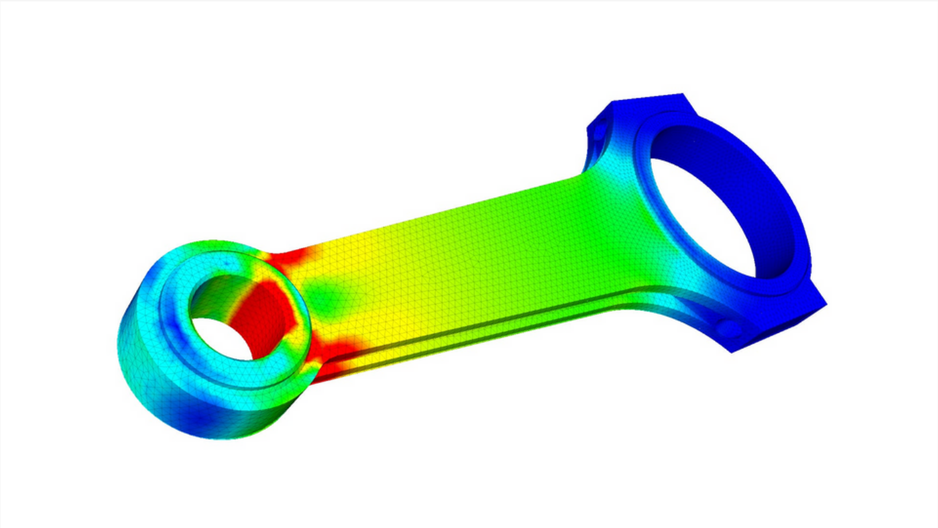
Objectives - II

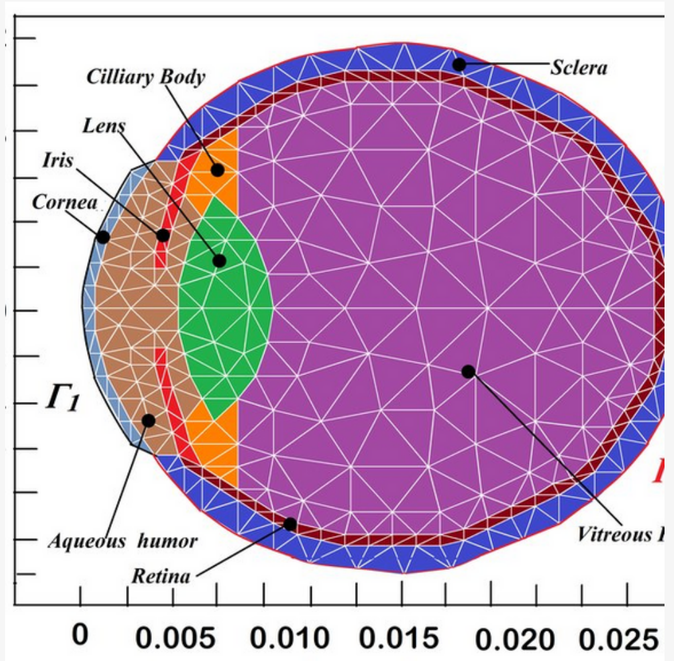
Learn to perform numericals manually and then implement those in a high level programming language



Objectives - III

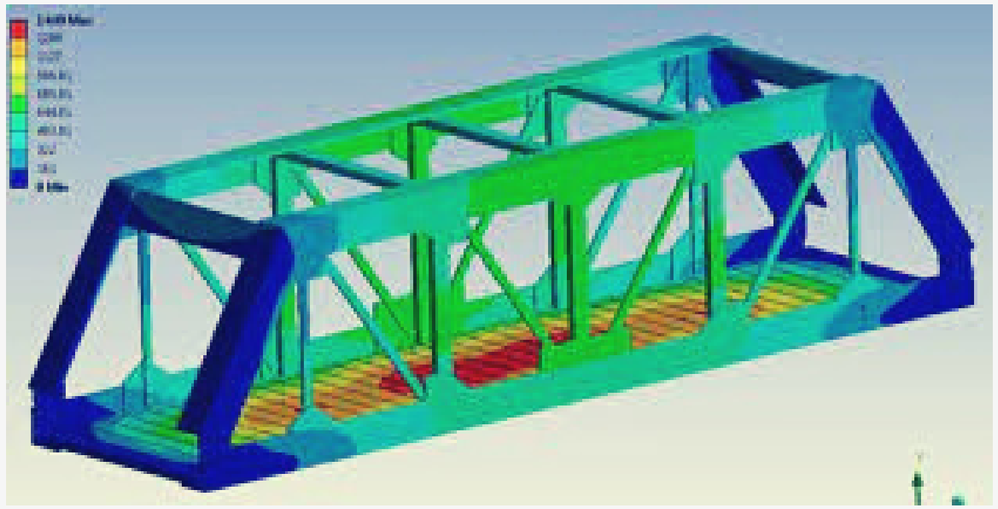
Learn about FEM, its variations, and its application to various mechanical and biological problems.

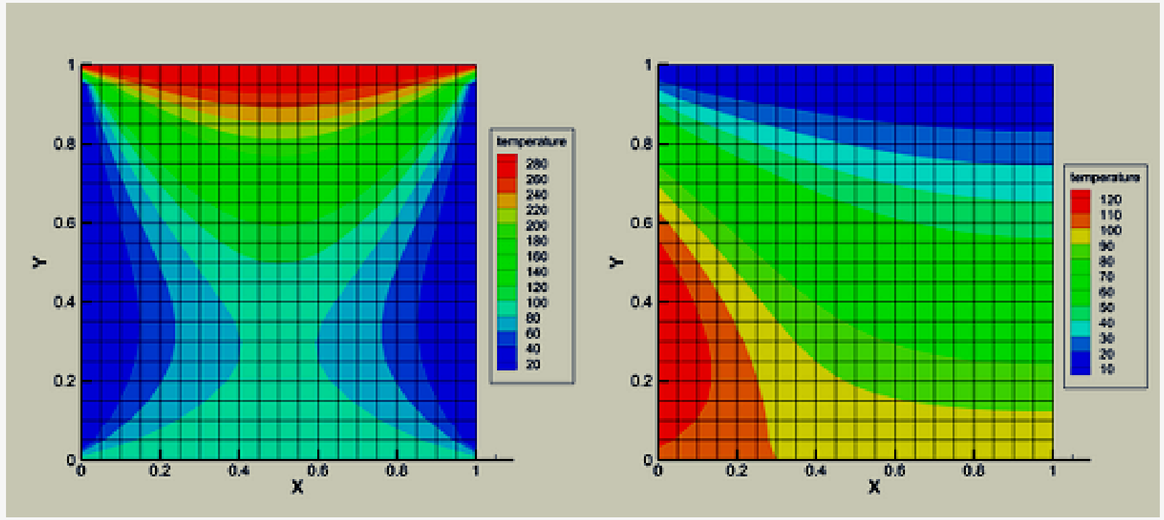




Objectives - IV

Visualization and Project Writing





Literature Review

almost 75 years ago in the 1940s

- 1941-1942 – Hrennikoff[1] and Courant[2] developed mesh discretization methods for solving elasticity and structural analysis problems in civil and aeronautical engineering.

- 1956 – Ray W. Clough[3] published the first paper on the finite element method (FEM). The term“finite elements” was coined in a 1960 article.

- 1957 - Another pioneer was Ioannis Argyris[4]. In the USSR, the introduction of the practical application of the method

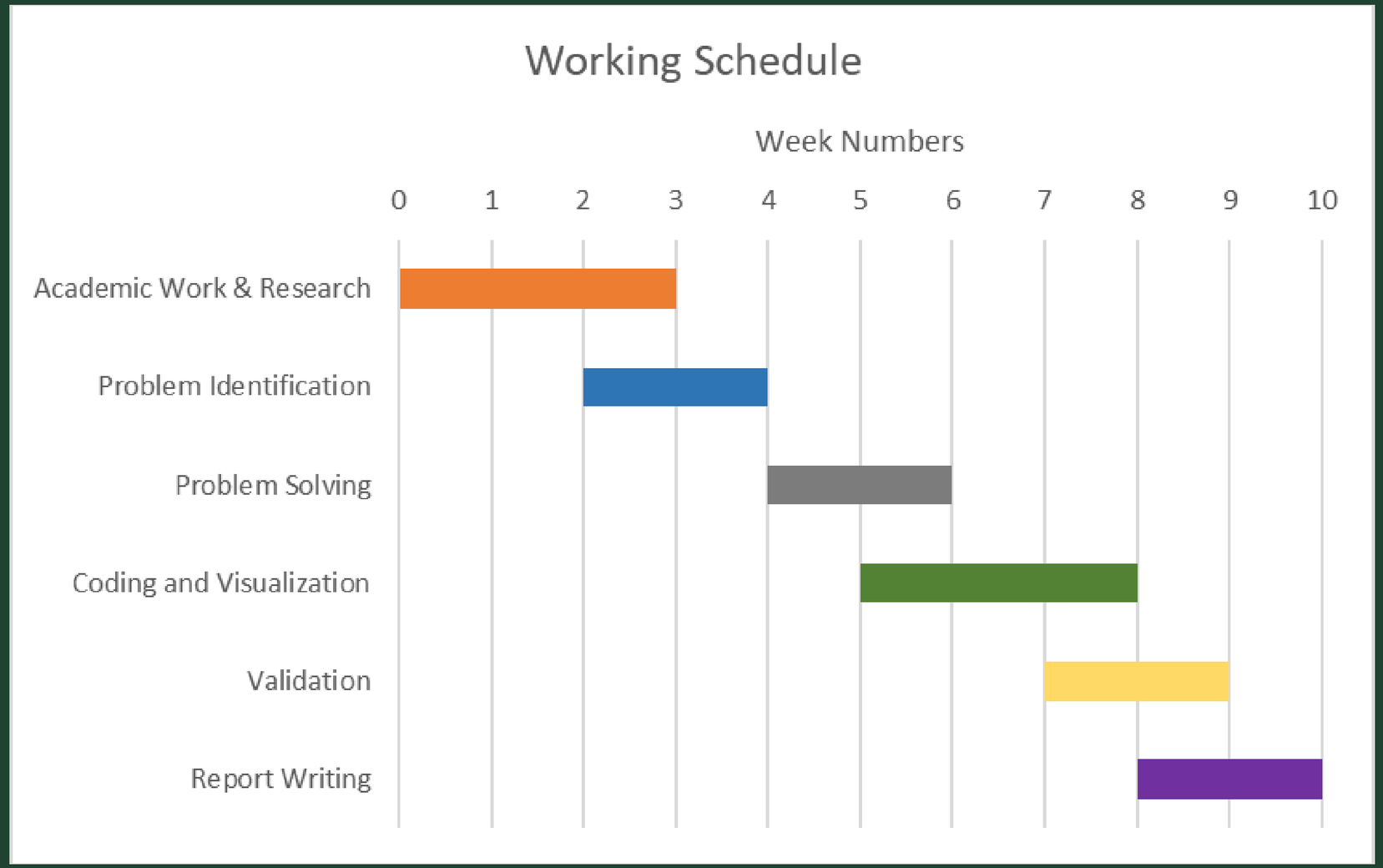
- 1971 - O. C. Zienkiewicz[5] with co-workers Ernest Hinton, Bruce Irons and others at Swansea University, Philippe G. Ciarlet at the University of Paris 6 and Richard Gallagher with co-workers at Cornell University provided the impetus

- open-source finite element programs. NASA sponsored the original version of NASTRAN, and UC Berkeley made the finite element program SAP IV widely available.

- 1972 - Babuska [6] generalized the method beyond just polynomials

- 1973 - A rigorous mathematical basis to the finite element method was provided with the publication by Strang [7] and Fix

Established Deadlines



Books reffered

- An introduction to the finite element method
  -J.N. Reddy
- The finite element method
  -Darrel W. Pepper, Juan C.Heinrich
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2. R. Courant, Variational methods for the solution of problems of equilibrium and vibrations, Bulletin of American Mathematical Society, v. 49, pp. 1-23 (1943)
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6. I. Babuska and A. K. Aziz, Survey lectures on the mathematical foundations of the finite element method, In The Mathematical Foundation of the Finite Element Method with Applications to Partial Differential Equations, pp. 3-636 (1972)
7. G. Strang and G. J. Fix, An analysis of the Finite Element Method, Prentice-Hall, Englewood Cliffs, New Jersey (1973)
8. J. T. Oden, Finite elements: An introduction, in Handbook of Numerical Analysis II, Finite element methods (Part I), North-Holland, Amsterdam, pp. 3-12 (1991)


Thank You