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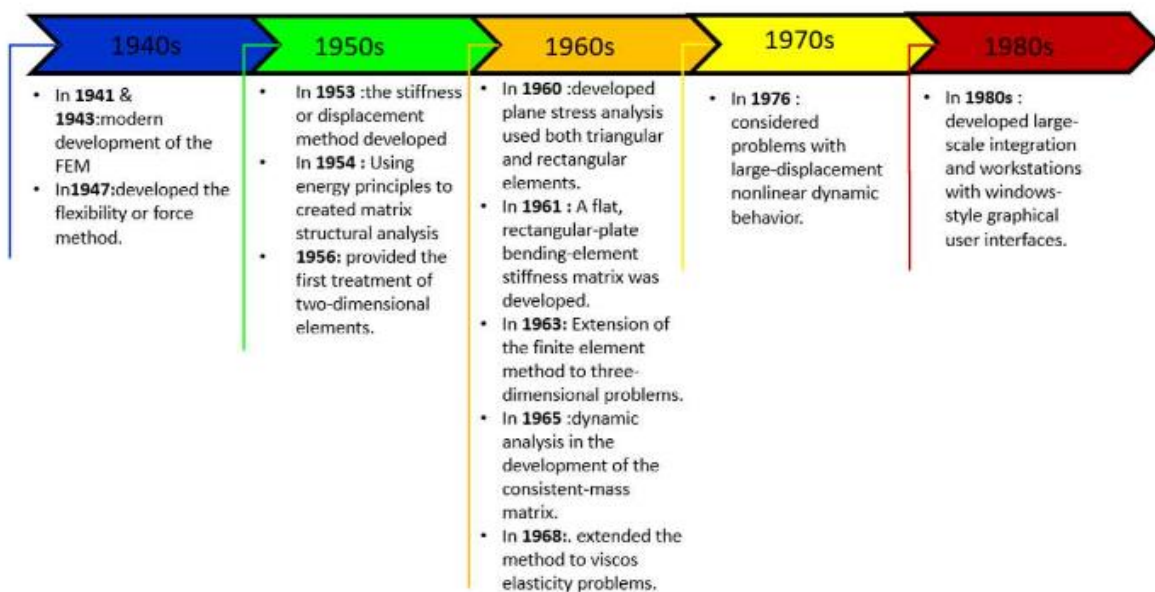
DEPARTMENT OF AEROSPACE ENGINEERING

Faculty Name : **Dr.M.Subramanian,** Academic Year : **2024-2025 (Odd)**
Prof & Head/ Aerospace
Year & Branch : **III Aerospace** Semester : **V**
Course : **19ASB302 – Finite Element Method for Aerospace**

Unit:1

History of the Finite Element Analysis

- ❑ 1940 ---- Basic ideas of FEA were developed by aircraft engineers in early 1940's. They are used matrix methods.
- ❑ 1943 ---- **Courant** (Variational methods)
- ❑ 1945 ---- **Hrennikoff**- Field of structural engineering
- ❑ 1947 ---- **Levy**- Introduce flexibility/ force method
- ❑ 1953 ---- **Levy** - Stiffness method for analysis aircraft structures
- ❑ 1954 ---- **Argyris & Kelsey** - Matrix structural analysis
- ❑ 1956 ---- **Turner, Clough, Martin and Topp** (Stiffness)
- ❑ 1960 ---- **Clough** ("Finite Element", plane problems)
- ❑ 1961 ---- **Turner** - Large deflection and thermal analysis problem
- ❑ 1962 ---- **Gallagher** - Non-linearities problems
- ❑ 1968 ---- **Zinkiewicz** - Visco elasticity problems
- ❑ 1969 ---- Weighted Residual method for structural analysis
- ❑ 1990s ---- Analysis of large structural systems



Brief history

- 1941 & 1943, With the work of Hrennikoff and McHenry in the field of structural engineering, the modern development of the finite element method started in the 1940s.
- In 1947, Levy developed the flexibility or force method, and his study recommended that a different approach should be used in 1953.
- In 1954, Using energy principles, Argyris and Kelsey created matrix structural analysis techniques.
- In 1956 Turner et al. provided the first treatment of two-dimensional elements. They created stiffness matrices for two-dimensional triangular and rectangular elements, beam elements, and truss elements in plane stress.
- In 1960 Clough developed the term “finite element” when plane stress analysis used both triangular and rectangular elements.
- In 1961, A flat, rectangular-plate bending-element stiffness matrix was developed by Melosh.
- In 1963 Extension of the finite element method to three-dimensional problems with the development of a tetrahedral stiffness matrix was done by Melosh.
- In 1963 Melosh’s realization that the finite element method could be set up in terms of a variational formulation, it began to be used to solve nonstructural applications.
- In 1965 Archer considered dynamic analysis in the development of the consistent-mass matrix.
- In 1968, Zienkiewicz et al. extended the method to visco elasticity problems.
- In 1969, using weighted residual techniques, first by Szabo and Lee to obtain the elasticity equations previously employed in structural analysis.
- In 1976, Belytschko considered problems associated with large-displacement nonlinear dynamic behavior and improved numerical techniques for solving the resulting systems of equations.
- In the late 1970s and early 1980s, Large-scale integration and workstations with windows-style graphical user interfaces were first developed, along with the computer