

SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



DEPARTMENT OF AUTOMOBILE ENGINEERING

19AUB303 – FINITE ELEMENT METHODS AND ANALYSIS

IV YEAR / VII SEM

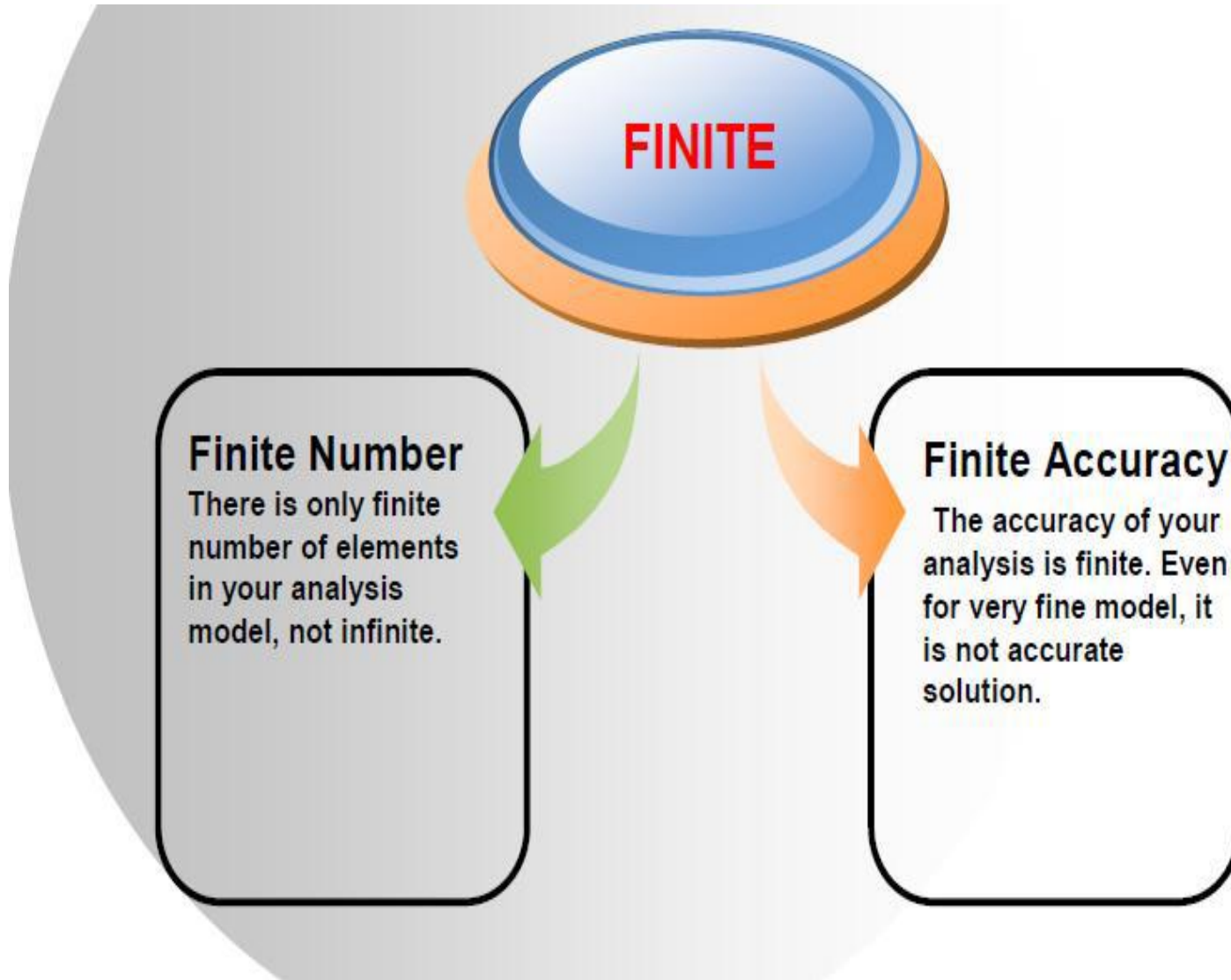
UNIT – 1 INTRODUCTION

Topic – 1 – Historical Background to FEM

Topic – 2 - Relevance and Scope of FEM

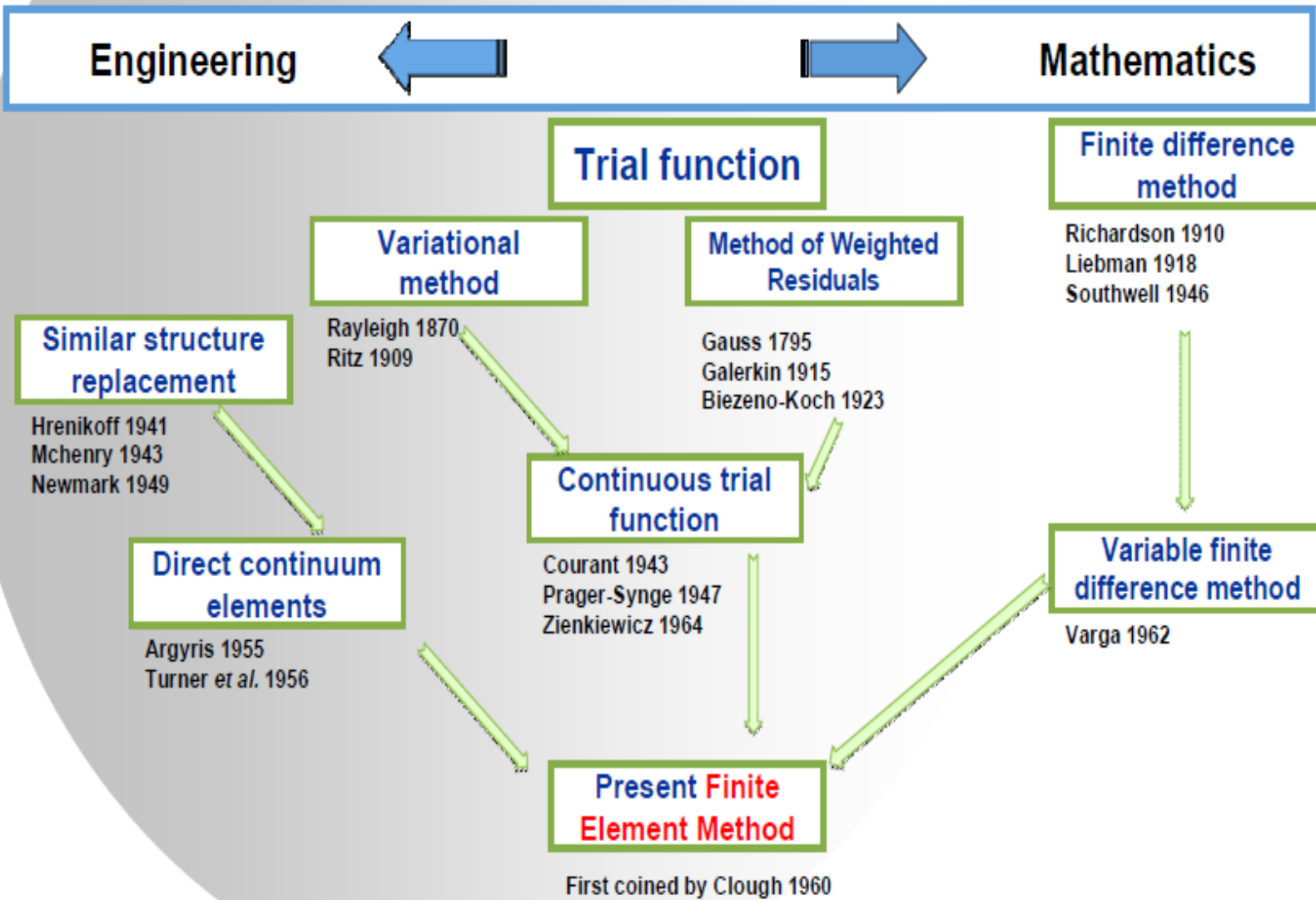


INTRODUCTION





History





How FEM help the Organization?



• Simulation using the FEM also offers important business advantages to the *design organization*:

- Reduced testing and redesign costs thereby shortening the product development time.
- Identify issues in designs before tooling is committed.
- Refine components before dependencies to other components prohibit changes.
- Optimize performance before prototyping.
- Discover design problems before litigation.
- Allow more time for designers to use engineering judgment, and less time “turning the crank.”



SCOPE OF FEM



❖ Civil Engineering Structures:

Analysis of

1. Trusses
2. Frames
3. Folded plates
4. Shell roofs
5. Bridges
6. Prestressed concrete structures
7. Shear walls





SCOPE OF FEM

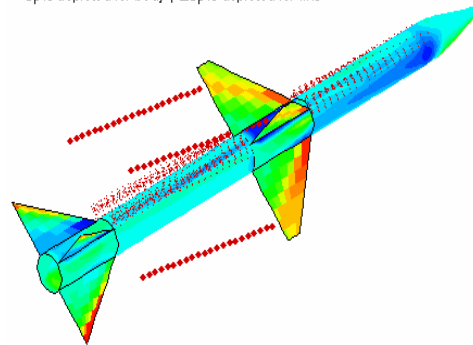


❖ Aircraft Structures:

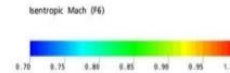
Analysis of

1. Aircraft wings
2. Fins
3. Rockets
4. Space crafts
5. Missile structures

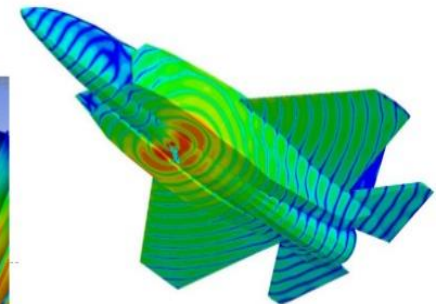
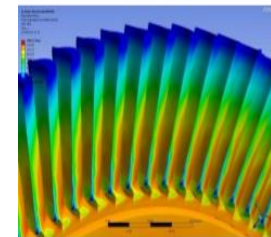
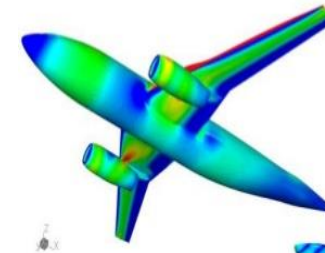
C_p is depicted for body ; ΔC_p is depicted for fins



Symbols represent fin and body shed vorticity
Symbol size representative of vortex strength



Examples using ANSYS software





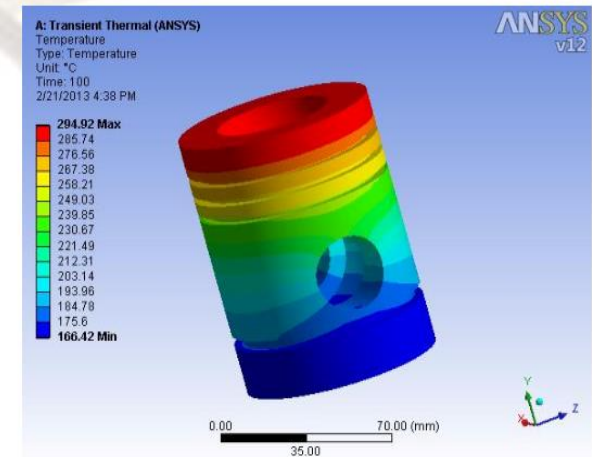
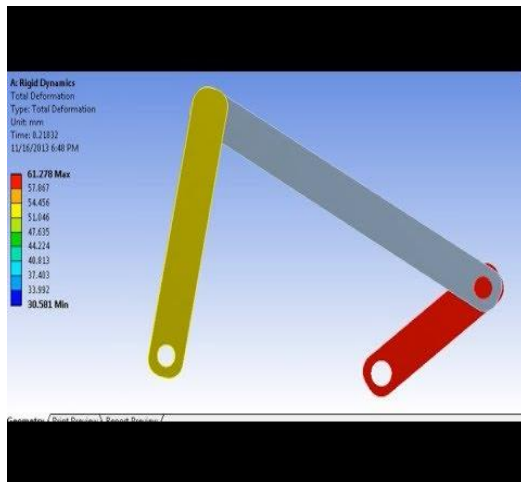
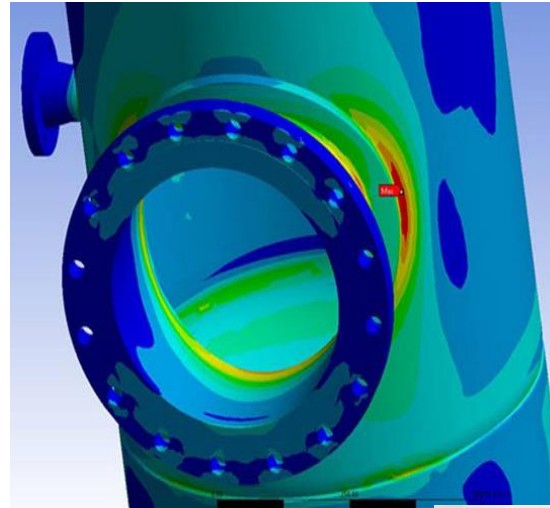
SCOPE OF FEM



❖ Mechanical Design:

Stress analysis of

1. Pressure vessels
2. Pistons
3. Composite materials
4. Linkages and Gears





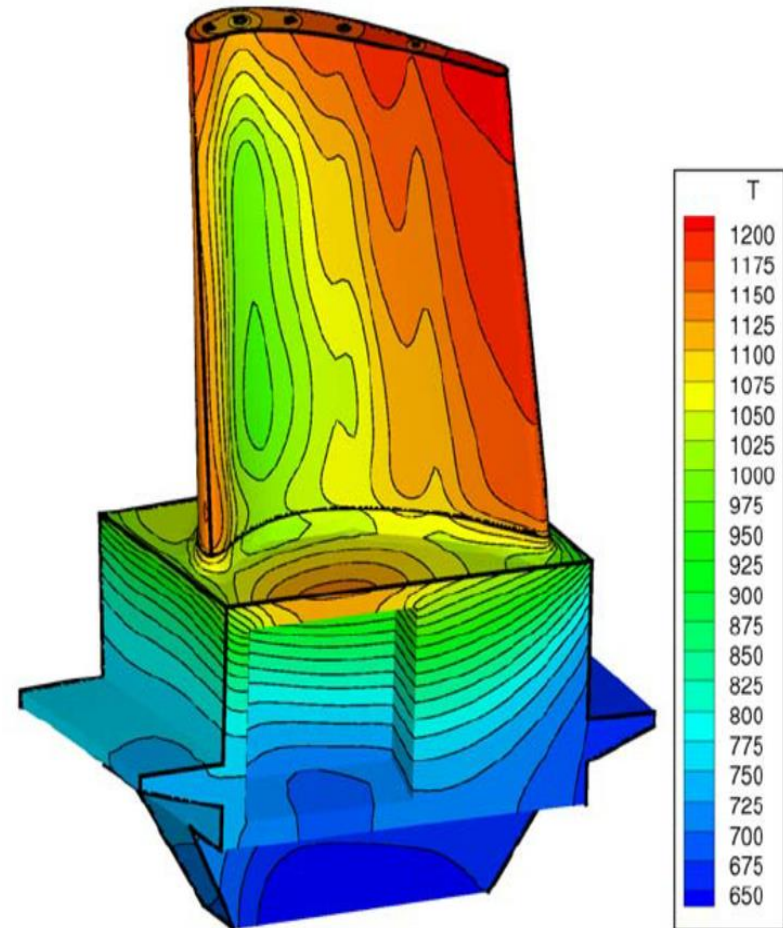
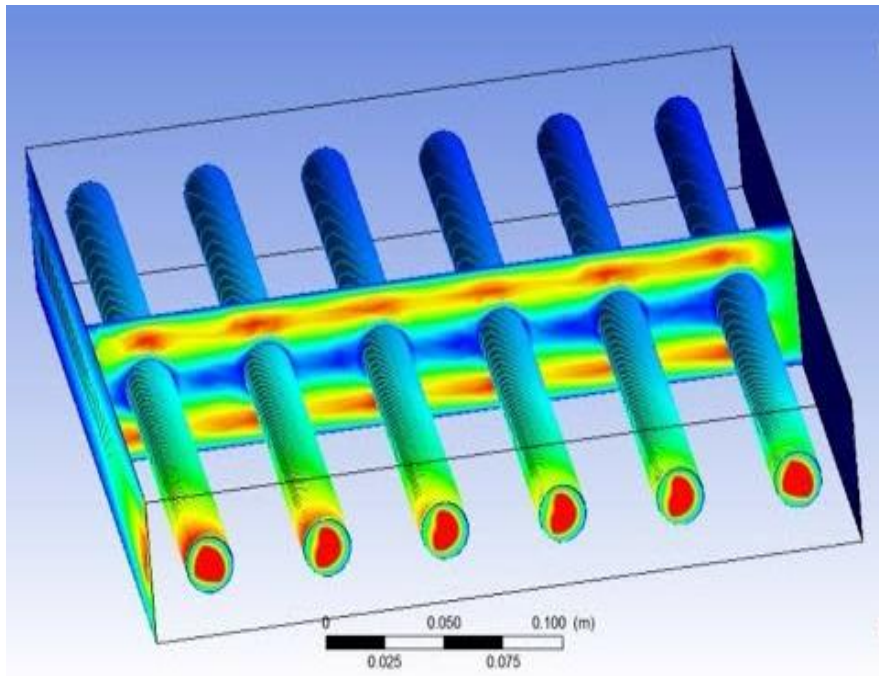
SCOPE OF FEM



❖ Heat Conduction:

Temperature distribution

1. Solids
2. Fluids





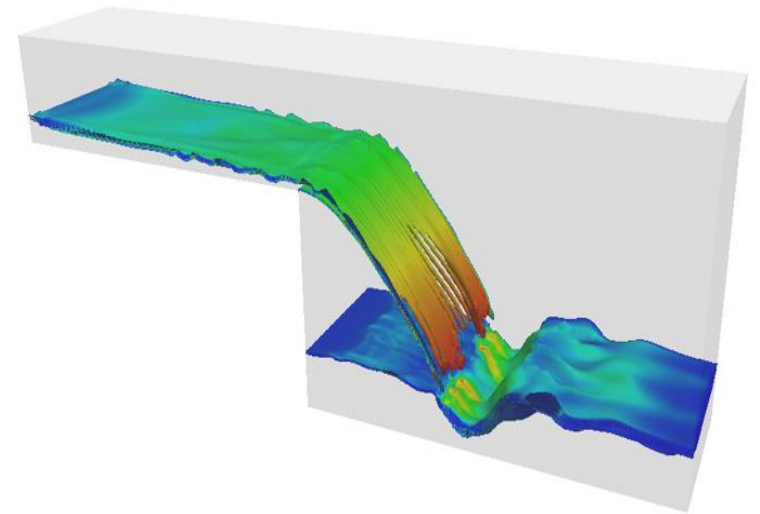
SCOPE OF FEM



❖ Hydraulic and water resource Engineering:

Analysis of

1. Potential flows
2. Free surface flows
3. Viscous flows
4. Hydraulic structure and dams





SCOPE OF FEM



❖ Electrical Machines and Electro Magnetics:

Analysis of

1. Synchronous and Induction machines
2. Eddy current
3. Core losses in Electrical machines

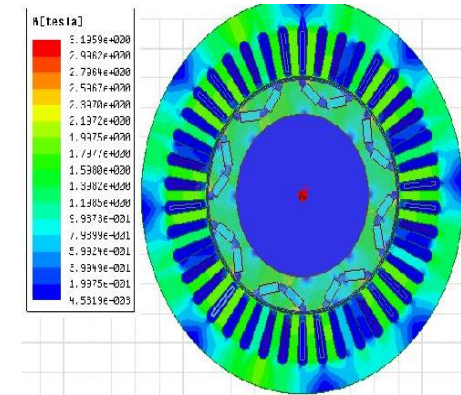
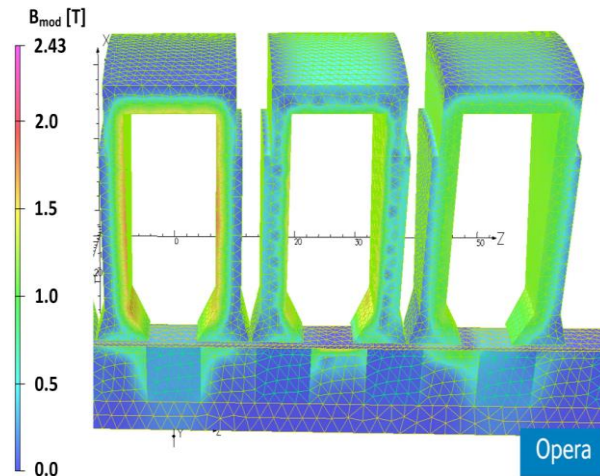


fig. 1. Magnetic Flux density $|\vec{B}|$ at any point of the machine.

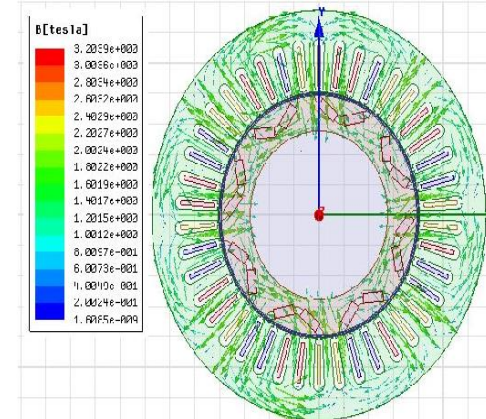


fig. 2. Amplitude of magnetic flux density \vec{B} vector direction over diff



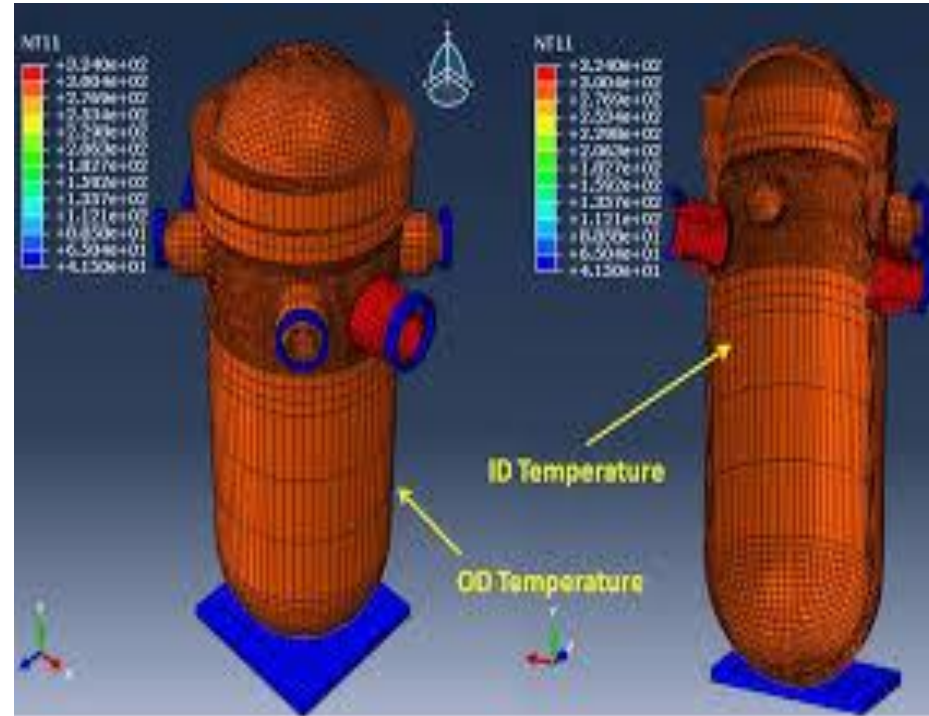
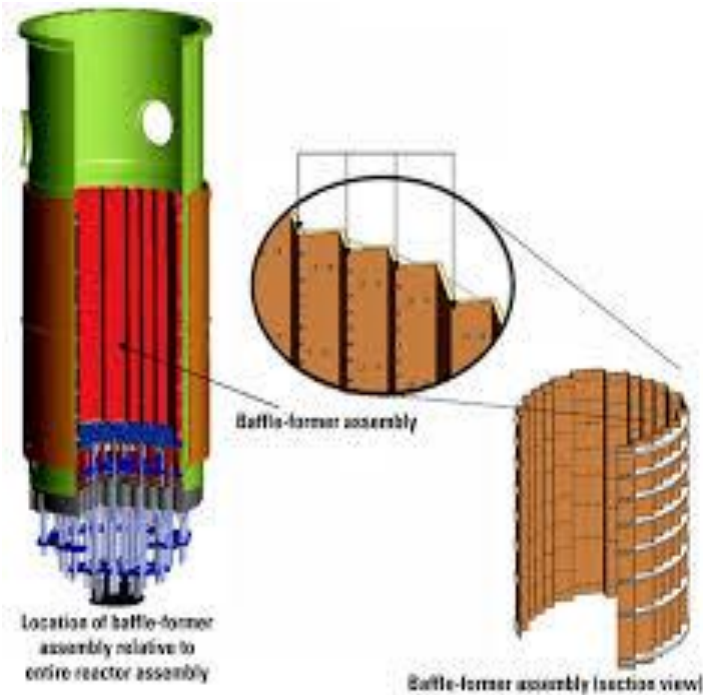
SCOPE OF FEM



❖ Nuclear Engineering:

Analysis of

1. Nuclear Pressure Vessels
2. Containment structures





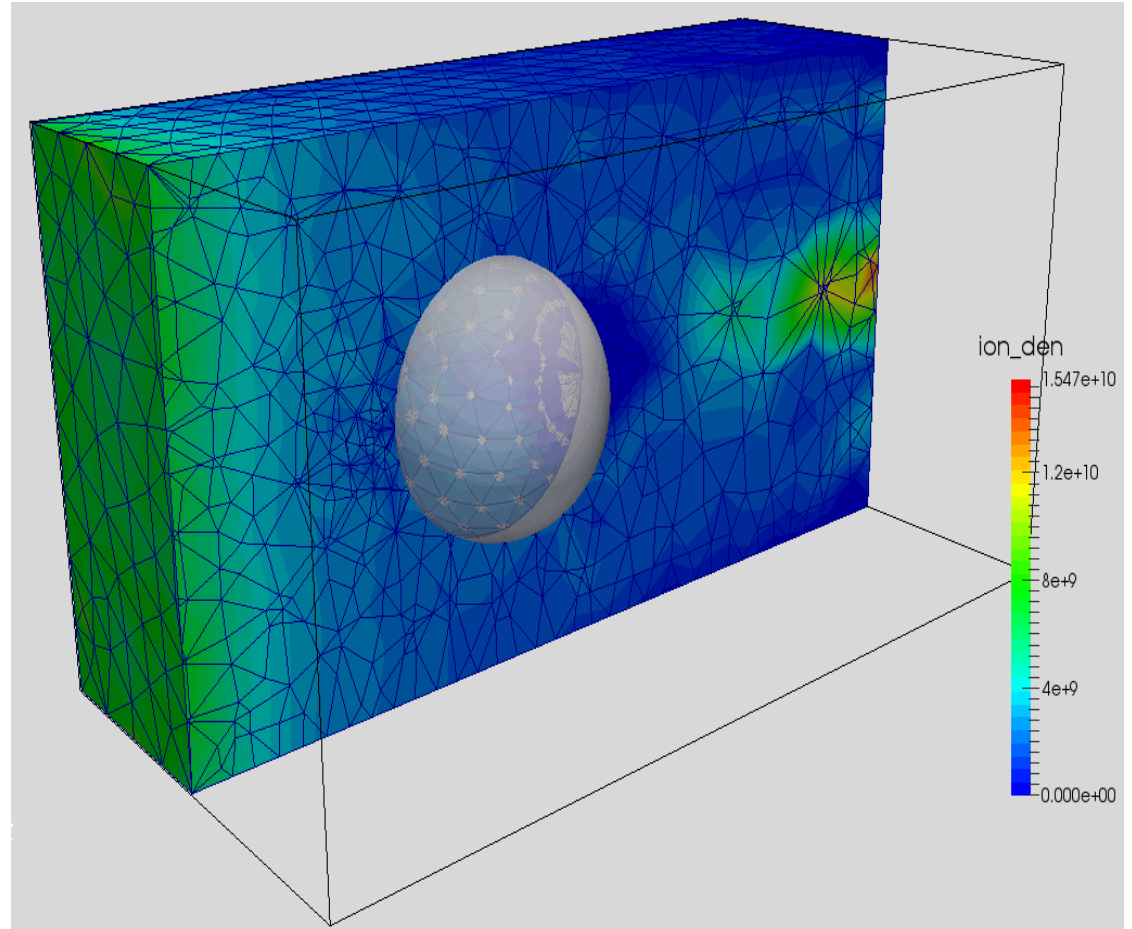
SCOPE OF FEM



❖ Geomechanics:

Stress analysis of

1. Soils
2. Dams
3. Layered piles and
4. Machine of heart valves





SCOPE OF FEM



❖ Bio Medical Engineering:

Stress analysis of

1. Eyeballs
2. Bones
3. Teeth
4. Heart Valves

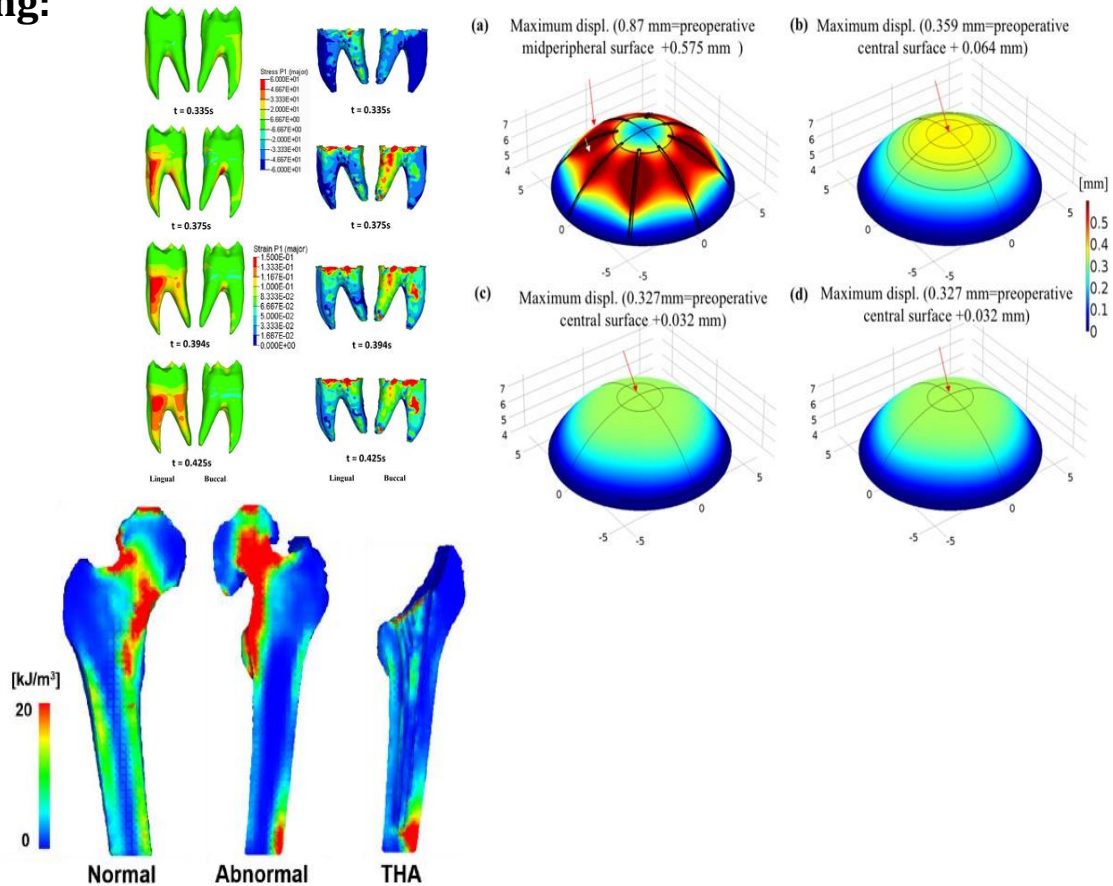


Figure 7: SED distribution on the cross-sections of femoral models.



References



1. “Textbook of Finite Element Analysis”, by P. Seshu
2. “Finite Element Analysis”, by S. Md. Jalaludeen

Thank you