1.	Title of the course	Nonlinear Finite Element Methods
2.	Course number	ME702L
3.	Structure of credits	3-0-0-3
4.	Offered to	PG
5.	New course/modification to	Modification To ME7221/10
6.	To be offered by	Department of Mechanical Engineering
7.	To take effect from	January 2022
8.	Prerequisite	CoT
9.	**Course Objective(s):** To learn finite element methods for solving engineering problems from heat transfer, fluid mechanics, nonlinear elasticity, plasticity, fracture mechanics, and viscoelasticity. To introduce the weak form and its linearization, and finite element procedure for respective problems. To solve some practical problems numerically using open source or commercial packages.	
10.	**Course Content:** Review of finite element methods for linear partial differential equations and linear elasticity; Kinematics, balance laws, frame indifference, stress rates, constitutive relations; Total Lagrange and updated Lagrange approaches; Weak forms and linearization, finite element formulations, direct and iterative solvers for the following problems: large strain elasticity for constrained and unconstrained materials, heat transfer, thermoelasticity, viscoelasticity, fracture mechanics, small strain and large strain plasticity, and fluid mechanics; Convergence analysis; Solving problems using commercial and/or open source packages.	
11.	**Textbook(s):** 1. Wriggers P, *Nonlinear Finite Element Methods*, Springer-Verlag (2008). 2. Zienkiewicz O C and Taylor R L, *The Finite Element Method: Volume 2- Solid Mechanics*, Butterworth-Heinemann (2000).	
12.	**Reference(s):** 1. Bathe K J, *Finite Element Procedures*, PHI Learning (1996). 2. Bonet J and Wood R D, *Nonlinear Continuum Mechanics for Finite Element Analysis*, Cambridge University Press (2008). 3. Simo J C and Hughes T J R, *Computational Inelasticity*, Springer (2000). 4. Zienkiewicz O C and Taylor R L, *The Finite Element Method: Volume 1- The Basis*, Butterworth-Heinemann (2000).	