

MA 549- Finite Element Method II

Course Code:	MA-549
UTAA Credit (Theoretical-Laboratory hours/week):	3(3-0)
ECTS Credit:	6.0
Department:	Mechanical and Aeronautical Engineering
Language of Instruction:	English
Level of Study:	Graduate
Offered Semester:	Fall and Spring Semesters.

Course Objectives

Knowledge and expertise in Strain- and stress measures for large displacements/deformations problems using Finite Element Methods. Experience in multidisciplinary evaluation of results from FEM analysis

Course Content

Classification of nonlinearities (geometrical, material and boundary conditions). Strain- and stress measures for large displacements/deformations. Mathematical models for elastic and elastoplastic materials. Geometrical stiffness and linearized buckling. Formulation of the nonlinear finite element method. Numerical integration of dynamically excited systems. Implicit/explicit time integration. Incremental-iterative solution methods for nonlinear static and dynamic problems. Modelling of nonlinear boundary conditions. Impact- and contact problems.

Course Learning Outcomes

- 1-Conduct simple deformation and buckling analysis of nonlinear bar and beam systems by hand calculation methods
- 2-Derive incremental stiffness relation for the bar elements based on the expression of potential energy
- 3-Use a general finite element program to model and solve simple nonlinear static and dynamic problems in a qualified manner
- 4-Difference in carrying out linear and nonlinear calculations based on first and second order theory Linearized buckling - phenomenology and the mathematical description.