EAS443 Finite Element Analysis of Aerospace Structures

Level: 4

Credit Units: 5 Credit Units

Language: ENGLISH

Presentation Pattern: EVERY JULY

Synopsis:

EAS443 Finite Element Analysis of Aerospace Structures introduces fundamental concepts and procedures of the Finite Element Method (FEM) for calculations of stress, strain, and deformation in structures and materials. Some necessary background in solid mechanics is briefed as to the foundation of FEM theory. Various finite element formulations and applications to one-, two- and three-dimensional problems in solid mechanics are central to the course. This course also describes the role of a commercial finite element package in aerospace structural analysis and design. The engineering practice of finite element analysis such as geometric modelling, mesh design, material constitutive behaviour, Verification and Validation (V&V) is introduced. Students are expected to carry out one or more projects with the software package independently by developing life-long learning skills. The course is for students with an interest in developing a career path in aerospace research & design.

Topics:

- Introduction to elasticity theory
- Principle of virtual work
- Introduction to the stiffness method
- Development of truss equations
- Development of beam equations
- Development of frame equations
- Development of plane stress and plane strain stiffness equations
- Development of linear-strain triangle equations
- Isoparametric formulation
- Three-dimensional finite element equations for stress analysis
- Special topics: axisymmetric elements, plate bending elements, structural dynamics
- Laboratory tutorials of finite element analysis of aerospace engineering problems

Learning Outcome:

- Appraise fundamental concepts of solid mechanics for finite element formulations.
- Formulate governing equations for basic finite elements including springs, bars, beams, frames, two-dimensional and three-dimensional solid elements.
- Calculate benchmark problems manually by following the general steps of the FEM.
- Construct mesh discretization of an aerospace structure for finite element analysis.
- Compute using simulation software for finite element analysis of aerospace engineering.
- Experiment Verification and Validation (V&V) of finite element simulations.

Assessment Strategies - Regular Semester (Evening Class):

Components	Description	Weightage Allocation (%)

Overall Continuous Assessment	QUIZ 1	6
	TUTOR-MARKED ASSIGNMENT 1	12
	LAB REPORT 1	12
Overall Examinable Components	ECA	70
Total		**100**

*The information listed is subject to review and change.