

FINITE ELEMENT ANALYSIS (FEGN)

FEGN525. ADVANCED FEA THEORY & PRACTICE. 3.0 Semester Hrs.

This course examines the theory and practice of finite element analysis. Direct methods of deriving the FEA governing equations are addressed as well as more advanced techniques based on virtual work and variational methods. Common 1D, 2D, and 3D element formulations are derived, and key limitations examined. Matlab is used extensively to build intuition for FEA solution methods and students will create their own 2D FEA code by the end of the course. The commercial FEA software Abaqus is introduced with hands-on examples and Matlab solutions are compared to Abaqus for model validation.

FEGN526. STATIC AND DYNAMIC APPLICATIONS IN FEA. 3.0 Semester Hrs.

This course emphasizes proficiency with commercial FEA software for solution of practical static, quasistatic, and dynamic structural problems. Common 1D, 2D, and 3D elements are examined in the context of linear solution techniques. Students will explore efficient methods for model construction and solution with commercial tools (the Abaqus FEA software). Emphasis will also be placed on verification, validation, and reporting standards for effective application of FEA software tools. Online course. Prerequisite: FEGN525.

FEGN527. NONLINEAR APPLICATIONS IN FEA. 3.0 Semester Hrs.

This course explores common nonlinearities frequently encountered in structural applications of FEA. Students will gain proficiency in modeling geometric nonlinearity (large strains), boundary nonlinearity due to contact, and material nonlinearity (creep, rate dependence, plasticity, temperature effects, residual stress). The commercial FEA software Abaqus is used for hands-on experience. Online course. Prerequisite: FEGN526.

FEGN528. FEA FOR ADVANCED DESIGN APPLICATIONS. 3.0 Semester Hrs.

In this course students will learn the automation tools and methods necessary for effective application of FEA on advanced design problems. Strategies for parametric analysis, performance optimization, and consideration of statistical uncertainty will be examined using Python scripting and commercial automation software. Online course. Prerequisite: FEGN526.