

Study Course: **Recent Advances in Numerical Modeling and Simulation**  
BI: Wahlfach W35 | CompEng: Optional Course

# NUMERICAL MODELING OF LAMINATED COMPOSITE PLATES AND SHELLS WITH DELAMINATIONS USING LAYERED FINITE ELEMENTS

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16:00 – 18:00  
IC 03/649

Laminar composites are modern engineering materials widely used in the mechanical and civil engineering. They are mostly used in a form of laminated composite and sandwich plates or shells. The goal of the presentation is to elaborate some recent advances in the numerical analysis of these structural members, using layered finite elements. The layered finite elements are derived based on the Generalized Laminated Plate Theory of Reddy (GLPT), which basic assumptions and restrictions will be illustrated. After that, the formulation of typical layered finite element will be given in detail. The derived solution will be extended for the analysis of laminated composite plates with existing zones of embedded delamination, which is the main form of damage in such structures. The possibilities of the extension of the proposed plate element for the analysis of different shell structures will be explained. Some general

aspects of the implementation of the layered finite element in the original object-oriented MATLAB code will be discussed, as well as the procedure of creation of the Pre/Post Processing environment in GiD Pre/Post Processor. The possibilities of the proposed numerical model for different structural applications will be presented using several numerical examples. The guidelines and possibilities of the extension of the proposed model by means of delamination propagation algorithms will be discussed. Finally, a time for discussion is planned at the end of presentation.

