



Invitation to PhD lecture

Georgios Martakos will defend his PhD thesis:

ENHANCED PERFORMANCE OF SANDWICH STRUCTURES BY IMPROVED DAMAGE TOLERANCE

FRIDAY, 20 JANUARY 2017, 10:00 hours, in Auditorium 1.108, Fibigerstræde 16, Aalborg, Denmark

Abstract:

The PhD thesis investigates the enhancement of the damage tolerance of sandwich structures by the embedding of a new type of core inserts that act as face/core interface crack stopping elements. The thesis presents the results of a series of experimental investigations where the new crack stopping elements were embedded in both sandwich beam and panel/plate specimens subjected to quasi-static as well as cyclic fatigue loading. The experimental observations has provided the basis for evaluating the efficiency of the proposed crack stopping inserts. For the experiments, Digital Image Correlation (DIC) was used to measure the local strain fields and overall deformation behaviour around the new crack stopper elements. In support of the experimental investigations, a Finite Element (FE) analysis based methodology, including fracture mechanics analysis and the so-called 'cycle jump' technique for fatigue simulations, was developed and applied to predict the progression of damage in sandwich beam and panel specimens with embedded crack stoppers.

Different configurations of the peel stopper were tested and the conditions for crack deflection for all configurations were identified by proposing and applying a fracture mechanics based crack kinking criterion. By use of the numerical fracture mechanics based modelling tools, both fatigue crack growth and crack arrest in the specimens were simulated. It was shown that the crack stoppers in all cases were capable of effectively capturing and containing a propagating interface debond crack, both for quasi-static and fatigue loading conditions. It was further shown that the presence of embedded crack stoppers significantly increased the fatigue life of the tested sandwich specimens. Finally, it was shown that the strains responsible for crack re-initiation on the back side of the new crack stopper can be accurately calculated enabling the prediction of the fatigue life of the specimens.

The opponents of the PhD lecture are:

Jørgen Kepler (chairman), *Associate Professor*

Department of Mechanical and Manufacturing Engineering, Aalborg University, Denmark

Bent F. Sørensen, *Professor*

Department of Wind Energy, Technical University of Denmark, Denmark

Paul M. Weaver, *Professor*

Department of Aerospace Engineering, University of Bristol, United Kingdom

Supervisor:

Ole Thybo Thomsen, Professor

Department of Mechanical and Manufacturing Engineering, Aalborg University, Denmark

Co-supervisor:

Jens H. Andreasen, Associate Professor

Department of Mechanical and Manufacturing Engineering, Aalborg University, Denmark

The public PhD defence will be chaired by **Associate Professor, Johnny Jakobsen**, Department of Mechanical and Manufacturing Engineering, AAU. The defence constitutes a 45 minutes presentation by **Georgios Martakos** followed by a short break and a discussion session with questions from the opponents and the auditorium.

After the lecture, at approx. 13:00 hours, the Department of Mechanical and Manufacturing Engineering will host a reception in Fibigerstræde 14, Common Room.

Everybody is very welcome!