



Composites @ Ghent University

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Ghent University

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Our industrial application areas

AEROSPACE COMPOSITES

- > bird strike (panels, fan blades, leading edge)
- > impact (large- and small-scale drop weight, crushing)
- > fatigue of thermoset and thermoplastic composites
- > fusion bonded joints of thermoplastic composites
- > ultrasound inspection
- > embedded optical fibre sensors

AUTOMOTIVE COMPOSITES

- > fatigue of unidirectional and textile composites
- > hybrid composites with steel cord reinforcement
- > adhesive and hybrid joints
- > axial crushing of composite crush cones
- > 3D woven thermoplastic composites



COMPOSITES FOR WIND ENERGY

- > detailed finite element modelling of large and small wind turbine blades
- > numerical modelling of thick adhesive joints in turbine blades
- > segmented blades for next generation 20 MW off-shore wind turbines
- > effects of blade imbalance on dynamics of small wind turbines
- > variable amplitude fatigue damage models
- > stability of floating LIDAR's for offshore wind velocity measurement

COMPOSITES FOR WAVE ENERGY

- > slamming wave impact of wedges, cylinders and plates
- > hydroelasticity of deformable bodies in wave slamming
- > design of new concepts for wave energy converters
- > coupling codes for simulation of real-time motion and power extraction of wave energy converters in irregular sea states

COMPOSITES FOR SPORTS

- > static, dynamic and field testing of composite racing bicycles
- > fatigue, damping and vibration of bicycle frames
- > composites for sailing masts
- > simulation of ball-surface interaction on artificial turf









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Our research areas



> tension

- > compression
- > rail-shear and bias tension
- > three- and four-point bending
- > resonance fatigue with electrodynamic shaker
- > biaxial fatigue (shape optimization)

INSPECTION & MONITORING

- > optical fibre sensors (cure monitoring, multi-axial strains)
- > Digital Image Correlation (DIC) algorithms
- > ultrasound inspection and Schlieren imaging
- > micro-tomography (micro-CT)
- > video-microscopy for online damage monitoring
- > optical microscopy and Scanning Electron Microscopy (SEM)



- > self-healing composites
- > steel fibre-reinforced composites
- > adhesive and hybrid joining of composites
- > natural fibre composites
- > vibration and damping of composites
- > fusion bonded joints in thermoplastic composites
- > wear of sliding composite bearings
- > structural membranes for tent structures



ADVANCED FINITE ELEMENTS

- > eXtended Finite Element Method (XFEM) for crack propagation
- > micro-meso-macro homogenization of unidirectional and textile composites
- > handshaking methods for molecular and continuum modelling
- > cohesive zone modelling for delamination, debonding and defragmentation
- > (partial) hybrid and mixed solid-shell elements with interlaminar stress continuity
- > Smoothed Particle Hydrodynamics (SPH) for bird strike, breaking waves, aircraft ditching
- > multiphysics simulations (air \leftrightarrow composite, ultrasound \leftrightarrow composite, water \leftrightarrow composite)
- > Arbitrary Lagrangian Eulerian (ALE) methods and adaptive node remeshing for material wear/erosion
- > parallel computing on Linux workstations, HPC cluster with 2000+ cores and supernode (720 GB RAM)