



SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS978

9 November 2022

A DCAMM seminar No. 760 will be presented by

Prof Kim J.R. Rasmussen
University of Sydney, Australia
Otto Mønsted Guest Professor, DTU

The title of the lecture is

Structural morphing induced by functionalising buckling

Abstract:

The lecture presents an overview of a recent research project at the University of Sydney aimed at developing a general framework for the analysis and design of functional components of buildings and structures, where such components achieve large shape changes (morphing) via buckling. The shape changes are optimised, e.g. to reduce energy consumption by minimising solar radiation loads or maximising natural air ventilation. The underlying driver for the project is to develop innovative building technology solutions to reduce the energy consumption for future generations of low-, medium- and high-rise buildings.

The lecture first summarises work on optimising the topology of plates to maximise their shading or ventilation capacities under applied compression or bending. Considering both buckling and nonlinear post-buckling, the analytical framework optimises the spatial distribution of plate thickness. Experiments on optimised plates are reported as well, in which shape memory alloy (SMA) and piezoelectric (PZT) actuators are used to induce compression and buckling. Work on plate elements supported along three edges is also described, in which temporary intermediate restraints are used to load the plate into the post-buckling range and subsequently released to generate abrupt shape change following an external signal triggered by shading or ventilation demand. Morphing induced by flexural-torsional buckling is described where simple frame geometries are devised to maximise the lateral buckling displacement and twist rotation under low-power external excitation, suitable for integration in façade construction as self-contained shading modules. The lecture concludes with demonstrating the use of snap-through buckling to produce bi-stable mechanisms with potential applications as shading and ventilation modules in double-skin façades, and as solutions for latching or deploying space equipment such as deployable solar arrays.

DATE:	Wednesday, 23 November 2022
TIME:	14:00 – 14:45
PLACE:	Meeting Room 003 in building 118 DTU, Technical University of Denmark

Danish pastry, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Niels Leergaard Pedersen

DANISH CENTER FOR APPLIED MATHEMATICS AND MECHANICS

- TECHNICAL UNIVERSITY OF DENMARK • AALBORG UNIVERSITY**
- AARHUS UNIVERSITY • UNIVERSITY OF SOUTHERN DENMARK**