



# SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS989

19 September 2023

A DCAMM seminar No. 769 will be presented by

**Professor K.C. Park**  
Department of Ann and H. J. Smead Aerospace Engineering Sciences  
University of Colorado, Boulder, USA

The title of the lecture is

**A Novel Method of FEM Modeling and Solution without Assembly: Can It Be Possible  
Part I: Theory and Formulation**

**Abstract:**

A new formulation for the displacement-only partitioned equations of motion for linear structures is presented, which employs: the partitioned displacement and acceleration and applied force  $(\mathbf{d}, \ddot{\mathbf{d}}, \mathbf{f})$ ; the partitioned block diagonal mass and stiffness matrices  $(\mathbf{M}, \mathbf{K})$ ; and, the coupling projector  $(\mathbf{P}_d)$ , yielding the partitioned coupled equations of motion:

$$\mathbf{M}\ddot{\mathbf{d}} = \mathbf{P}(\mathbf{f} - \mathbf{K}\mathbf{d})$$

The preceding DP (Displacement-only Partitioned) equations of motion (1) possess two key features. The nonzero frequencies and the static displacements ( $\ddot{\mathbf{d}} = 0$ ) are the same as those obtained by the corresponding assembled FEM equations.

The key element of the proposed DP equations is the coupling projector  $(\mathbf{P}_d)$  which can be constructed with the partitioned mass matrix  $(\mathbf{M})$  the Boolean matrix that extracts the partition boundary degrees of freedom  $(\mathbf{B})$  and the assembly matrix  $(\mathbf{L}_g)$  relating the assembled displacements  $(\mathbf{d}_g)$  to the partitioned displacements  $(\mathbf{d})$  via  $\mathbf{d} = \mathbf{L}_g \mathbf{d}_g$ .

DATE: **Tuesday, 3 October 2023**

TIME: **13:00 – 13:45**

PLACE: **Building 308, Auditorium 11**  
DTU, Technical University of Denmark

For virtual participation please use the following link:

<https://dtudk.zoom.us/j/63694665190?pwd=d2hpQlZ2QTYvaWNUdS9xeVdKcStuUT09>

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**
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