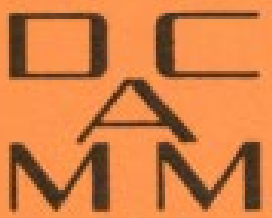
# DANISH CENTER FOR APPLIED MATHEMATICS AND MECHANICS

## ANNUAL REPORT
## 2019




TECHNICAL UNIVERSITY OF DENMARK -
AALBORG UNIVERSITY - AARHUS UNIVERSITY –
UNIVERSITY OF SOUTHERN DENMARK

# DANISH CENTER FOR APPLIED MATHEMATICS AND MECHANICS

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## Chairman

Associate Professor Niels Leergaard Pedersen
Department of Mechanical Engineering, Solid Mechanics.
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# FOREWORD

This annual report for the year 2019 follows the same format that we initiated last year, where we primarily report on DCAMM seminars given and guests at the cooperating departments. This year the content has been extended with the possibility for the departments to give specific information related to activities or changes at the department, this year only DTU Compute has contributed. The purpose of the report is still mainly to serve as a reference and documentation for accomplished activities. Detailed information is available on our homepage: www.dcamm.dk and on the homepages of the cooperating departments and universities.

The year 2019 was a very active year for DCAMM. In March 2019 the 17th bi-annual internal DCAMM Symposium took place at hotel Comwell Kellers Park, Vejle, with 101 participants. At Thursday 7 November 2019, we celebrated the 50 year anniversary of DCAMM, with 74 participants. The celebration was a half-day symposium that included the annual speaker seminar and three invited lectures from past annual DCAMM speakers. The annual speaker seminar was given by professor Yuri Bazilevs from Brown University under the title "Isogeometric analysis of solids, fluids and FSI for extreme-event simulation". The three anniversary lectures was given by; Professor John W. Hurchinson from Harvard University, Professor Nigel Peake from University of Cambridge and Professor Gaëtan Kerschen from University of Liege.

Furthermore, a total of 13 DCAMM seminars were held in 2019 and 7 courses were given in the auspices of DCAMM. All the details are available at the DCAMM webpage.

As of January 1st 2020, the departments cooperating in DCAMM are:

from the **Technical University of Denmark**:
DTU Civil Engineering
DTU Compute
DTU Mechanical Engineering
DTU Wind Energy

from **Aalborg University**:
Department of the Built Environment (BUILD)
Department of Materials and Production
Department of Mathematical Sciences

from **Aarhus University**
Department of Engineering

from **University of Southern Denmark**
Department of Technology and Innovation

I thank all the members of DCAMM and our international contacts for their support and inspiration, and I look forward to our future continued collaboration.

Niels Leergaard Pedersen

# CONTENTS

## 1. MEMBERS 2019

62 professors
239 scientific members
157 PhD students
} at the nine cooperating departments at the Center

29 elected members
4 foreign members

(A complete list of names is given in the Appendix).

## 2. FOREIGN MEMBERS

Professor John W. Hutchinson
Division of Applied Sciences
Harvard University, 315 Pierce Hall
29 Oxford St.
Cambridge, MA 02138
USA

Professor Ole Secher Madsen
Ralph M. Parsons Laboratory
Massachusetts Institute of Technology
Cambridge, MA 02139
USA

Professor Alan Needleman
Department of Materials Science & Engng.
Texas A&M University 3003
College Station
TX 77843-3003
USA

Professor S. Nemat-Nasser
Jacobs School of Engineering
University of California, San Diego
4209 Engineering Building 1
9500 Gilman Drive
La Jolla, CA 92093-0416
USA

## 3. GUESTS FOR EXTENDED PERIODS IN 2019
(more than a fortnight)

**Guest professors & post docs:**

Bayo, Eduardo, University of Navarra, Spain, 1.4.19 – 30.6.19

Cao, Jia Fa, Yang-Zhou University, 20.8.19 – 30.8.20

Dantan, Jean-Yves, Arts et Métiers Paris Tech Metz, France, 1.9.19 – 31.8.20

Guo, Su, HoHai University, China, 1.7.19 – 1.9.19

Hasannasab, Marzieh, TU Kaiserslautern, Germany, 1.2.19 – 4.3.19

Hourigan, Kerry, Monash University, Australia, 1.7.19 – 30.9.19

Kim, Rae Young, Yeungnam University, South Korea, 15.7. – 15.8.19

Li, Liang, Yancheng Institute of Technology, 21.1.19 – 20.12.19

Liu, Jianyu, Harbin Engineering University, China, 1.12.19 – 25.2.20

Obaton, Anne-Françoise, Laboratoire National De MéTrologie Et D'Essais (Lne), France, 4.11.19 – 31.3.20

Pan, Hongjiang, Kunming University, China, 1.11.19 – 31.10.21

Pan, Lisheng, Institute of Mechanics, Chinese Academy of Sciences, China, 1.4.19 – 30.4.20

Peng, Yawei, Nanjing Tech, China, 1.6.19 – 1.6.21

Sun, Liang, China, 15.12.19 – 14.12.20

Takami, Tomoki, National Institute of Maritime, Port and Aviation Technology, Japan, 1.10.19 – 30.9.20

Wen, Chuang, University of Nottingham, United Kingdom, 1.4.19 – 30.6.19

Xi, Weixiu, Beijing University of Civil Engineering and Architecture, China, 1.4.19 – 31.3.20

Xu, Cang, HoHai University, China, 7.10.19 – 7.11.19

Yaacob, Mohd Rusdy, Shahid Chamran University, Ahvaz, Malaysia, 19.3.19 – 31.5.19

Zhang, Xiaoja, University of Illinois at Urbana Champaign, USA, 31.10.19 – 1.12.19

**PhD students**

Andres, Rojano Crisson, University of Concepcion, Chile, 16.4.19 – 13.7.19

Auenhammer, Robert Michael, Chalmers University, Sweden, 11.7.19 – 30.11.23

Baizhuma, Zhandos, al-Farabi Kazakh Nu, Kazakstan, 5.11.19 – 4.10.20

Bressanelli, Gianmarco, University of Brescia, Italy, 1.4.19 – 28.6.19

Carraro, Gianluca, University of Padova, Italy, 1.10.19 – 3.3.20

Dos Santos Solheid, Juliana, Karlsruhe Inst. of Techn., Germany, 7.1.19 – 15.2.19

Fang, Cheng, Harbin Inst. of Technology, China, 15.11.19 – 17.11.20

Gao, Luyao, China, 17.9.19 – 17.2.20

Guo, Jia, Tsinghua University, China, 1.3.19 – 30.8.19

Guo, Ying, Tianjin University, China, 1.11.19 – 31.10.20

He, Yong, Xi'An Jiatong University, China, 18.1.19 – 9.1.20

Hu, Faping, Chongqing University, China, 1.9.19 – 1.9.20

Ji, Zhihang, Harbin Institute of Technology, China, 8.12.19 – 8.12.20

Kai, Wu, Tsinghua University, China, 31.7.19 – 8.9.19

Lei, Xiuchuan, Chongqing University, China, 12.8.19 – 15.2.20

Li, Quhao, Shandong University, China, 1.10.19 – 1.10.20

Lou, Yunfeng, Dalian University, China, 1.9.19 – 1.9.20

Ma, Guoqiang, Chongqing University, China, 1.3.19 – 28.2.20

Maccioni, Lorenzo, Free University of Bolzano, Italy, 4.2.19 – 28.6.19

Murphy, Sam, University of Washington, USA, 12.8.19 – 20.12.19

Perez, Ignacio Vidal, Spain, 1.3.19 – 31.5.19

Quian, Gen, Wuhan University, China, 15.9.19 – 14.9.20

Ranjan, Rajit, TU Delft, The Netherlands, 2.8.19 – 30.11.19

Rezaei, Amirsajjad, Iran, 1.5.19 – 31.10.19

Selvam, Kalimuthu, University of Tokyo, Japan, 18.11.19 – 18.12.19

Shen, Zhenyu, Harbin Engineering University, China, 1.12.19 – 30.11.20

Shuai, Linfei, Chongqing University, China, 1.3.19 – 28.2.20

Wang, Kang, Hefei University of Technology, China, 15.10.19 – 15.4.21

Xianche, Xu, China, 1.9.19 – 31.8.20

Yu, Xueying, Harbin Engineering University, China, 1.9.19 – 1.9.21

Lu Zhou, Northwestern Polytechnical University, NWPU, China, 1.12.19 – 31.5.20

Zhu, Chunyue, Hohai University, China, 1.8.19 – 31.1.21

Zhu, Wenxin, Xi'An Jiatong University, China, 15.11.19 – 14.11.21

# 4. DCAMM SEMINARS GIVEN IN 2019

## Predictive Manufacturing for Operating Conditions

Professor Petri Kuosmanen, Head of Engineering Design, Department of Mechanical Engineering, Alto University, Helsinki, Finland

held at Aarhus Universiy, Department of Engineering 14 January 2019

**Abstract:**

With the new technology large flexible rotors are machined to achieve an optimal geometry for their actual working conditions.
Rotating machinery equipped with large rotors is widely used in different industrial applications, e.g., electric motors and generators, wind turbines, turbines, marine propulsion systems, paper machines, and steel rolling mills. Although machining accuracy has improved significantly over the years and micrometer level accuracy is achieved in machine shop conditions, the dynamics and thermal load related challenges regarding the rotor behavior in actual working conditions cannot be met by tightened manufacturing tolerances.

The new technology relies on two procedures: a model updating algorithm and a new compensative manufacturing process. These two procedures form together a simulation assisted compensative 3D machining process that generates an optimized rotor geometry that will enhance the rotor operational behavior in actual industrial applications. In this new methodology, the rotors have to be machined to achieve the optimal geometry for its actual working conditions, which include rotating frequency, bearing assembly, foundation stiffness, temperature, and external loads.

**Quantification of Manufacturing Defect Severity in Composites for Failure Assessment**

by Professor Ramesh Talreja, Department of Aerospace Engineering, Department of Aerospace Engineering, Department of Materials Science and Engineering, Texas A&M University, USA

held at DTU Risø Campus 15 March 2019

## Abstract:

Composite materials are manufactured by a variety of processes that produce microstructural compositions depending on the process histories. In spite of efforts to achieve perfect microstructures, real manufactured composites contain defects in the forms of nonuniform fiber distributions, fiber misalignment, matrix voids, etc. Such defects affect the composite's performance, such as structural integrity and durability, when exposed to service environments. In many cases, the early failure events are significantly affected by the defects, and inadequate account of these effects leads to inaccurate assessment of damage progression and ultimate failure. Furthermore, evaluating the goodness of the manufacturing process requires that the defects are quantified in terms of their severity with respect to the performance metric. A concept for defect severity quantification will be proposed that generalizes the geometric size characterization and allows incorporation of the parameters governing the particular failure mode under consideration. Two failure modes in unidirectional composites will be taken to illustrate implementation of the defect severity measures: a) transverse cracking and b) longitudinal fiber microbuckling

**Mechanics-guided Deterministic 3D Assembly**

by Professor Yonggang Huang, Departments of Civil and Environmental Engineering, Mechanical Engineering and Materials Science and Engineering, Northwestern University, Evanston, IL, USA

held at DTU Mechanical Engineering 28 March 2018

**Abstract:**

Complex three-dimensional (3D) structures in biology (e.g., cytoskeletal webs, neural circuits, and vasculature networks) form naturally to provide essential functions in even the most basic forms of life. Compelling opportunities exist for analogous 3D architectures in human-made devices, but design options are constrained by existing capabilities in materials growth and assembly. We report routes to previously inaccessible classes of 3D constructs in advanced materials, including device-grade silicon [1]. The schemes involve geometric transformation of 2D micro/nano-structures into extended 3D layouts by compressive buckling. Designs inspired by kirigami/origami [2,3] and/or releasable multilayers [4] enable the formation of mesostructures with a broad variety of 3D geometries, either with hollow or dense distributions. Demonstrations include experimental and theoretical studies of more than 100 representative geometries, from single and multiple helices, toroids, and conical spirals to structures that resemble spherical baskets, cars, houses, cuboid cages, starbursts, flowers, scaffolds, each with single- and/or multiple-level configurations. Morphable 3D mesostructures whoese geometries can be elastically altered can be further achieved via nonlinear mechanical buckling, by deforming the elastomer platforms in different time sequences [5]. We further introduce concepts in physical transfer, patterned photopolymerization and non-linear plasticity to enable integration of 3D mesostructures onto nearly any class of substrate, with additional capabilities in access to fully or partially free-standing forms, all via mechanisms quantitatively described by theoretical modeling [6]. Compatibility with the well-established technologies available in semiconductor industries suggests a broad range of application opportunities [7]. Illustrations of these ideas include their use in building 3D structures as radio frequency devices for adaptive electromagnetic properties [5], as open-architecture electronic scaffolds for formation of dorsal root ganglion (DRG) neural networks [6], as ultra-stretchable interconnects for soft electronics [8] and as catalyst supports for propulsive systems in 3D micro-swimmers with geometrically controlled dynamics [6].

References

[1] Xu et al., 2015. Science, 347, pp.154-159.
[2] Zhang et al., 2015. PNAS, 112, pp.11757-11764.
[3] Yan et al., 2016. Advanced Functional Materials, 26, pp.2629-2639.
[4] Yan et al., 2016. Science Advances, 2, pp.e1601014.
[5] Fu et al., 2018. Nature Materials, 17, pp. 268-276.
[6] Yan et al., 2017. PNAS, 114, pp. E9455-E9464.
[7] Zhang et al., 2017. Nature Reviews Materials, 2, pp. 17019.
[8] Jang et al., 2017. Nature Communications, 8, pp.15894.

**A new stochastic descent method for the efficient solution of structural optimization problems with infinitely many load cases**

by Professor Michael Stingl, Friedrich-Alexander-University Erlangen-Nürnberg,
Lehrstuhl für Angewandte Mathematik 2, Erlangen, Germany
held at DTU Mechanical Engineering 5 April 2019

**Abstract:**

Recently, stochastic gradient methods (SG) have been successfully applied to structural optimization problems with a large number of load cases. The advantage of the SG method is that in each iteration of the algorithm only a single state problem has to be solved while a deterministic method requires the solution of state problems for all individual load cases in every iteration. In this presentation, this idea is generalized in two ways: first, we assume that the objective depends on an arbitrary set of parameters, while the only assumption we use is that this dependency is locally Lipschitz continuous. Second, instead of a discrete parameter set (as in the multiple load case example) we want to allow for continuous parameter sets. Then the objective functional which is minimized over an admissible set is given as an integral over these parameters. To name some particular examples, parameters can encode the location of a load in an elastic setting, a wave length in a time harmonic setting, or, when properties of particulate systems are optimized, a size distribution in a poly-disperse setting. The presented scheme (SIG) is related to the idea of the stochastic average gradient method (SAG), which is mainly known from the field of machine learning. However, In contrast to the SAG method, for the new SIG scheme no discretization of the integral type objective by a quadrature rule is required. Thus, apart from its efficiency, a main advantage of the SIG method is its convergence to an optimal solution for the (non-discretized) objective functional. In general, this cannot be expected, if a deterministic optimization method or an SG-type algorithm, relying on a quadrature rule, is applied. The reason is that the discretization of the integral can lead to an arbitrary number of artificial local optima. Apart from the algorithmic idea, convergence properties as well as numerical results for a linear elastic setting are presented.

**Optimal design of modulated and orented lattice materials by the homogenization method**

by Professor Grégoire Allaire, Department of Applied Mathematics, Ecole Polytechnique, Palaiseau, France

held at DTU Mechanical Engineering 5 April 2019

**Abstract:**

This talk will discuss the optimization of so-called lattice structures made of periodically perforated material, where the microscopic periodic cell can be macroscopically modulated and oriented. This is a three-step process. First, one compute the homogenized properties of a well-chosen family of parametrized periodicity cells. Second, one optimize the homogenized formulation of the macroscopic problem, which is an easy task of parametric optimization. Third, the optimal microstructure is projected on the macroscopic domain at a desired lengthscale, which is a delicate issue, albeit computationally cheap. The combination of these three steps is a topology optimization method for lattice structures.

The main novelty of our work is the third projection step which amounts to build a global orientation of the microstructures. It requires a regularization of the orientation and the construction of a diffeomorphism following this orientation. In 2-d, such a diffeomorphism is built thanks to a conformal treatment of the optimal orientation, ensuring that, although the periodicity cell has varying parameters and orientation throughout the computational domain, the angles between its members or bars are preserved. In 3-d, conformality cannot be achieved and a different direction-by-direction reconstruction is proposed. Several numerical examples are presented for compliance minimization in 2-d and 3-d. The issue of possible singularities in the orientation field will be briefly discussed. This is a joint work with Perle Geoffroy-Donders and Olivier Pantz.

**CFD simulation of vertical-axis wind turbines**

by Associate Professor Krzysztof Rogowski, Warwaw University of Technology, The Institute of Aeronautics and Applied Mechanics, Warsaw, Poland

held at DTU Wind Energy 23 April 2019

**Abstract:**

The flow through the Darrieus wind turbine is very complex. In the upwind and in the downwind parts of the rotor the blades of the device work in different flow conditions. In the downwind side of the rotor the turbulent intensity is higher while the flow velocity is compared to the upwind side of the rotor. This results in poorer blade performance and significant fluctuations in the torque of the entire rotor. Blade brackets and rotor shaft also have a significant influence on rotor performance.

During this seminar, the earlier results of the 40-kW rotor will be presented. The results for the rotor with NACA 0018 airfoils were obtained by using the unsteady RANS approach with the SST k-ω turbulence model. The numerical results performed using ANSYS Fluent solver were also compared with the results obtained using a CFD code FLOWer from German Aerospace Center that was continuously extended for wind energy applications at IAG and a vortex model from DTU. In the numerical studies, six four-digit airfoils of NACA series with various thickness and shape of the mean line are used. The highest power coefficient is obtained for NACA 2414 airfoil.

The second part of the seminar concerns to the CFD results of a small H-Darrieus rotor with a rotor diameter of 1 m operating at thetip speed ratio of 4.5. The results of velocity field obtained using the actuator cell model (ACM) and the k-ω SST turbulence modelare compared with the PIV results from the works of Carlos Simao Ferreira. The work presents a significant impact of the rotor blades on the turbine shaft and the interaction of the aerodynamic wake of the shaft with the turbine blades.

**Scalable Model and Dataset Development Informing Integrated Energy Pathways at NREL**

by Researcher Clayton Barrows, Economics and Forecasting Group in the Strategic Energy Analysis Center, NREL, Denver, Colorado, USA

held at Aarhus University, Department of Engineering 23 May 2019

**Abstract:**

We are witnessing a revolutionary transition of energy infrastructure around the world. As infrastructure systems transform, they will be required to deliver critical services reliably, resiliently, securely, affordably, and in an environmentally responsible fashion. Additionally, advances in computation and connectivity have enabled emerging opportunities and challenges for system integration to support these requirements of modern infrastructure. Infrastructure modernization is disrupting the status quo of markets, planning, and operational procedures. NREL strives to address these challenges and help evaluate and understand energy infrastructure transformation across a broad technology landscape through the development and analysis of leading-edge modeling tools and datasets.

This presentation will showcase key NREL modeling and analysis activities focusing on NRELs open-access datasets and a new suite of open-source infrastructure system models.

**Ductile fracture criterion and its calibration**

by Professor Jeong Whan Yoon 1,2*
1 Department of Mechanical Engineering, KAIST, Daejeon 305-701, Republic of Korea
2 Institute for Frontier Materials, Deakin University, Waurn Ponds, VIC 3216, Australia

held at DTU Mechanical Engineering 14 June 20198

**Abstract:**

Ductile fracture criterion is usually calibrated by shear, uniaxial tensile, plane strain tests. Stress-based fracture model is proposed in this study. It is observed that a nonlinear model with the mean stress shows a better correlation than the normal stress model. The shear point is very important to show the mean stress effect. However, it is often observed that triaxiality for shear specimen changes severely during shear fracture test and then the nonlinearity in triaxiality occurs. It is important to fabricate fracture specimens with minimum variation of triaxiality in order to characterize the ductile failure models accurately, where strain path is assumed to be linear. In this study, a “smiling” face shear specimen is optimized by minimizing the variation of stress triaxiality in the shear zone. In the optimization, Hill48 and Yld2000-2d (Barlat et al., 2003) criteria and Hill48 with non-associated flow rule are employed to model the anisotropic deformation of AA 6k21. The triaxiality plot for an optimized specimen based on Yld2000-2d is obtained experimentally. As an application, nonlinear strain path fracture including drawing, redrawing and expansion is presented. The proposed stress-based model with kinematic hardening shows excellent prediction of failure. Finally, simulation-based design of a long aluminium battery cell (AA 3003) with D&I is proposed for electric vehicle.

**Developments of Nonlinear Guided Wave Techniques for Structural Safety Inspection**

by Associate Professor Alex Ching Tai Ng, School of Civil, Environmental and Mining Engineering, Faculty of Engineering, Computer and Mathematical Sciences, The University of Adelaide, Australia

held at SDU, University of Southern Denmark 21 June 2019

**Abstract:**

Monitoring critical-sections of structures overs their lifetime in order to reduce life cycle costs, provide early detection of potential defects, and improve reliability and availability of the structures, is of vital importance in many technical fields, including civil, aerospace and mechanical engineering. Guided waves have attracted much attention in the area of damage detection over the last decade because of their high sensitivity to small and different types of defects, and ability to inspect large areas of structures.

This seminar provides a basic concept of nonlinear guided waves. It then focuses on the recent developments on the nonlinear guided wave damage detection techniques in providing early detection and identification of defects in structures. The capability of the non-linear guided waves is studied and discussed in detail. The seminar will also demonstrate the nonlinear guided wave techniques can be applied in different types of structure components.

**Piezoelectric finite element analysis of smart materials ad structures experiments: mathematical, mechanical and technological key issues**

by Professor Ayech Benjeddou [1,2]:
[1] Laboratoire ROBERVAL de l'Université de Technologie de Compiègne (UTC) & du Centre National de la Recherche Scientifique (CNRS), Compiègne, France
[2] Institut Supérieur de Mécanique de Paris (SUPMECA), Saint Quen, France
held at DTU Mechanical Engineering 5 September 2019

**Abstract:**

This seminar discusses mathematical, mechanical and technological key issues for performant model/test correlation with smart materials and structures applications. After introducing the piezoelectric mathematical constitutive behaviours, technological dominant response modes resulting from the polarization and electrodes configurations, variational formulations and finite element (FE) discretisations of the electromechanical equations for sensing, actuation and vibration, the through-the-thickness quadratic induced potential (IP) effect and its implementation in common commercial and in-house FE codes are first discussed. Then, the effects of the physical equipotential (EP) mathematical constraints, resulting from piezoelectric patches electrodes, on the correlation with smart structures applications experiments are highlighted. It is shown, in particular, that the technological EP effect is higher than the mathematical IP one. Next, the technological and mechanical issues of series and parallel electric connections according to the polarizations configurations and their FE implementation are illustrated for trimorph (symmetric) smart structures. Some comments on mechanical modelling of unimorph (asymmetric) configurations are also given. Finally, practical FE simulation of the experimentally observed field-dependent nonlinear piezoelectric actuation response is presented for adhesively bonded shear macro-fibre composite patches.

**Ludwig Prandtl's scientific life**

by Professor Dr. Alois Schaffarczyk, University of Applied Science Kiel /Mech Eng Dep, Wind Turbine Aerodynamics, Germany

held at DTU Wind Energy 1 October 2019

**Abstract:**

Ludwig Prandtl (1875 – 1953) is regarded as one of the fathers of modern Fluid Mechanics.

In our lecture we will summarize his work with emphasis on wind turbine aerodynamics

**Metamaterials: Imitating Nature and beyond**

by Senior Scientist, Dr. Andrea Bergamioni, EMPA – Swiss Federal Laboratories for Materials Science and Technolog, Dübensdorf, Switzerland

held at DTU Mechanical Engineering 14 November 2019

**Abstract:**

From the point of view of a materials scientist, the present interest in phononic materials is a dream come true: We can easily test the lessons learned about the structure-properties relationship in materials without having to give too much thought about the thermodynamic and kinetic challenges that challenge 'classical' material synthesis. Moreover, in the spirit of the definition of atoms offered by Lapine and Tretyakov, we can introduce in our atoms and atomic links novel and unusual properties and functionalities that will help us synthesize useful phononic materials for engineering applications. This talk offers some examples, from a materials science perspective.

**Non-intrusive reduced order models using Gaussian processes**

by Professor of Mathematics, Chair of Computational Mathematics and Simulation Science Jan S. Hesthaven, EPFL, Lausanne, Switzerland

held at DTU Compute 18 November 2019

**Abstract:**

The development of reduced order models for complex applications, offering the promise for rapid and accurate evaluation of the output of complex models under parameterized variation, remains a very active research area. Applications are found in problems which require many evaluations, sampled over a potentially large parameter space, found in optimization, control, uncertainty quantification and applications where near real-time response is required.

However, many challenges remain to secure the flexibility, robustness, and efficiency needed for general large-scale applications, in particular for nonlinear and/or time-dependent problems.

After a brief introduction to projection based reduced order models, we discuss the use of data driven Gaussian process regression to enable the development of fast and accurate nonintrusive models for complex problems, including techniques for greedy regression/active learning and error estimation. We illustrate the performance by examples taken from nonlinear mechanics and fluid dynamics.

To enable the modelling of more complex problems, we discuss the development of hybrid element based reduced order model with local nonlinear elements, allowing for the rapid and fast evaluation of the response of large and complex structures with applications in design, uncertainty quantification, and risk assessment.

Time permitting we extend the discussion to the multi-fidelity case where different models are combined through co-kriging and the use of data driven techniques to enhance the predictive accuracy of the reduced models.

This work has been done with in collaboration with M. Guo (EPFL, CH), Z. Zhang (EPFL, CH), M. Kast (ETHZ, CH).

## 5. DCAMM ANNUAL SEMINAR SPEAKER 2019

The DCAMM Annual Seminar Speaker was this year given by Professor Yuri Bazilevs from Brown University.
The seminar was given at DTU Thursday 7 November in connection with DCAMM 50 years anniversary – see next page

### Isogeometric Analysis of Solids, Fluids, And FSI for Extreme-Event Simulation

**Abstract:**

This presentation is focused on Isogeometric Analysis (IGA) and modeling of extreme events. In particular, a novel framework for air-blast-structure interaction (ABSI) based on an immersed approach coupling IGA and Meshfree particle methods is presented and verified on a set of examples. Several numerical challenges exist for carrying out the aforementioned simulations, and these are addressed in the presentation. The challenges include, among others, ratment of localization of deformation, capturing of shocks in both the fluid and solid parts of the problem, and addressing near incompressibility, which is important in the presence of plastic deformations. The presentation is infused with examples that highlight the power and general applicability of the ABSI framework.

## 6. DCAMM 50 YEARS

DCAMM had 50 years jubilee 27 October 2019. The jubilee was celebrated 7 November including this year annual seminar speaker – see previous page. Furthermore, three anniversary speakers held the following lectures

- Professor John W. Hutchinson, Harvard University, USA

  **Buckling Loacalization**
  Examples of localization phenomena in buckling has emerged as being central to efforts currently underway to arrive at less conservative buckling criteria based on improved analysis methods and experimental methods and advances shel manufacturing. Our talk will begin with a brief overvies outlining the importance of localization in shell buckling, and will then address localization in spherical shells subject to external pressure. In addition to being an important structure in its own right, the spherical shell has the added attraction that all the essential nonlinear behaviour is present for shells undergoing axisymmetric behaviour, and thus described by ordinary, not partial, differential equations. Loacalization is at the heart of why Koiter's initial post-buckling and imperfection theory has a very limited range of validity for spherical shell buckling. Even if Koiter himself was not aware of subsequent analytical approaches to localization, he made a major effort to address the limitations of his basic theory in his tratise on spherical shell buckling published in 1969. Stimulated in part by Koiter's efforts, Basile Audoly and I have studied localization in spherical shell buckling using a combination of analytical and numerical methods. Our findings reveal the remarkably abrupt localization process that sets in immediately after the onset of buckling. The implications of localization in spherical shells will be related to buckling localization in other shell structures and to localization in other contexts.

- Professor Nigel Peake, University of Cambridge, UK

  **Boundary Layer Noise and the Silent Owl**
  When hunting many, but not all, species of owl manager to fly almost silently in the audible frequency range of both themselves and their prey. A complete understanding of hos this is done has yet to be found, but it is believed that three rather unusual features of the owl wing and feathers play a significant role. These features include a leading-edge comb of barbs (perhaps vortes generators), a porous and flexible trailing edge brush, and a particularly unusual microstructure in the feathers which leads to a velvet-like wing suction surface. Although the first feature is found on other raptors, the second two are quite unique to owls which hunt in acoustic stealth. In this talk I will describe a range of theoretical and experimental research which has been conducted to attempt to undertand these mechanisms. It is well-known in other contexts that a turbulent boundary layer passing over a wing trailing edge is a potentially potent source of noise, and so a particular focus of our work has been to investigate the ways in which the owl's adaptations may have weakened this noise mechanism. An owl-inspired trailing-edge noise control noise control device will be described.

- Professor Gaëtan Kerschen, University of Liège, Belgium

  **Dynamic Vibration Absorbers: Revisitin Classical Results and Introducing New Tuning Strategies**

  The classical dynamic vibration absorber is an effective passive vibration mitigation device widely used in, e.g., civil and automotive applications. This presentation first revisits the well-known equal-peak method proposed by Den Hartog almost one century ago. We show how an exact closed-form solution to the H-infinity optimization problem can be derived. In view of the narrow bandwidth of the dynamic vibration absorber, we then introduce new tuning strategies adapted to uncertain or nonlinear host structures. The second part of the presentation addresses novel practical designs of liniear and nonlinear dynamic vibration absorbers, which include the joint use of topology optimization and additive manufacturing, and piezoelectric shunting with electrical and digital circuits.

## 7. ACTIVITY AT THE DEPARTMENTS
## DTU COMPUTE

In July – September DTU Wind hosted an Otto Mønsted Guest Professor in collaboration with DTU Compute. The guest professor was Kerry Hourigan, Monash University, Melbourne, Australia. During his stay at DTU professor Hourigan gave a very successful PhD course "Vorticity, Vortical Flows, and Vortex-Induced Vibrations". Other lecturers were Thomas Leweke, Aix-Marseille Université, Jens Nørkær Sørensen, DTU Wind and Morten Brøns, DTU Compute. 18 students from 11 countries participated, and also found time to an excursion in Copenhagen and a trip on the canals.

## 8. LIST OF DCAMM S-REPORTS (from no. S85)

S1 – S107: Ask for separate book.

S108. JONCQUEZ, SOIZIC ANNICK GABRIELLE: Second-order Forces and Moments acting on Ships in Wawes (August 2009)

S109. DÜHRING, MARIA BAYARD: Optimization of acoustic, optical and optoelastic devices (July 2009)

S110. NIELSEN, KIM LAU: Modelling of damage development and ductile failure in welded joints (December 2009)

S111. ESTUPINAN, EDGAR ALBERTO: Feasibility of Applying Controllable Lubrication Techniques to Reciprocating Machines (December 2009)

S112. BANG-MØLLER, CHRISTIAN: Design and Optimization of an Integrted Biomass Gasification and Solid Oxide Fuel Cell System (April 2010)

S113. PEDERSEN, RUNE: Dynamic Modeling of wind Rubine Gearboxes and Experimental Validation (April 2010)

S114. BRIX, WIEBKE: Modelling refrigerant distribution in minichannel evaporators (May 2010)

S115. HUMMELSHØJ, THOMAS STRABO: Mechanisms of metal dusting corrosion (December 2009)

S116. CIPOLLA, LEONARDO: Conversion of MX Nitrides to Modified Z-Phase in 9-12%Cr Ferritic Steels (March 2010)

S117. HAIDER, SAJJAD: Two Stroke diesel Engines for Large Ship Propulsion (January 2011).

S118. VELTE, CLARA: Simultation and control of Wind Turbine Flows using Vortex Generators (February 2009)

S119. ENZ, STEPHANIE: Factors Affecting Coriolis Flowmeter Accuracy, Precision, and Robustness (September 2010)

S120. KJÆRSGAARD-RASMUSSEN, JIMMY: Inside-out electrical capacitance tomography for downhole multiphase flow evaluation (April 2010)

S121. LAJIC, ZORAN: Fault-Tolerant Onboard monitoring and Decision Support Systems (October 2010)

S122. SVENDSEN, MARTIN NYMANN: Wind Turbine Rotors with Active Vibration Control (January 2011)

S123. CLAUSEN, LASSE RØNGAARD: Design of novel DME/methanol synthesis plants based on gasification of biomass (February 2011)

S124. SHIN, KEUN WOO: Cavitation simulation on marine propellser (November 2010)

S125. HAUGAARD, ASGER MARTIN: On Controllable Elastohydrodynamic Fluid Film Bearings (May 2010)

S126. PEDERSEN, TROELS DYHR: Homogeneous Charge Compression Ignition Combustion of Dimethyl Ether (May 2011)

S127. GARCÌA, NÈSTOR RAMOS: Quasi-3d aerodynamic code for analysing dynamic flap response (April 2011)

S128. ZAMBRANO, HARVEY A: Molecular Dynamics Studies of Nanofluidic Devices (May 2011)

S129. AAGE, NIELS: Topology optimization of radio frequency and microwave structures (April 2011)

S130. MATZEN, RENÉ: Topology Optimization for Transient Wave Propagatio Problems (March 2011)

S131. ANDREASEN, CASPER SCHOUSBOE: Multiscale topology optimization of solid and fluid structures (May 2011)

S132. KÆRN, MARTIN RYHL: Analysis of flow maldistribution in fin-and-tube evaporators for residential air-conditioning systems (August 2011)

S133. BEHRENS, TIM: Simulation of Moving Tailing edge Flaps on a Wind Turbine Blade using a Nivier-Stokes based Immersed Boundary Method (July 2011)

S134. BLASQUES, JOSÉ PEDRO ALBERGARIA AMARAL: Optimal Design of Laminated Composite Beams (August 2011)

S135. AZIZI, REZA: Multi-scale modelling of composites (September 2011)

S136. JACOBSEN, NIELS GJØL: A Full Hydro- and Morphodynamic Description of Breaker Bar Development (April 2011)

S137. MOROSI, STEFANO: From Hybrid to Actively-Controlled Gas Lubricated Bearings – Theory and Experiemt (September 2011)

S138. KÆRGAARD, KASPER: Numerical Modeling of Shoreline Undulations (September 2011)

S139. BHOWMIK, SUBRATA: Modelling and Control of Magnetorheological Damper: Real-time implementation and experimental verification (October 2011)

S140. ANDKJÆR, JACOB: Wave Manipulation by Topology Optimization (January 2012)

S141. MOSLEMIAN, RAMIN: Residual Strength and Fatigue Lifetime of Debond Damaged Sandwich Structures (September 2011)

S142. HANSEN, SØREN VINTHER: Performance Monitoring of Ships (September 2011)

S143. HANSEN, NILAS MANDRUP: Interaction between Seabed Soil and Offshore Wind Turbine Foundations (March 2012)

S144. THOMSEN, KIM: Modeling of dynamically loaded hydrodynamic bearings at low Sommerfeld numbers (March 2012)

S145. WANG, FENGWEN: Systematic Design of Slow Light Waveguides (August 2012)

S146. RASMUSSEN, JOHANNES TOPHØJ: Particle Methods in Bluff Body Aerodynamics (October 2011)

S147. ANDERSEN, SØREN BØGH: Design and Optimization of Gearless Drives using Multi-Physics Approach (September 2012)

S148. LAHRIRI, SAID: On the Rotor to Stator Contact Dynamics with Impacts and Friction – Theoretical and Experimental Study (November 2012)

S149. VARELA, ALEJANDRO CERDA: Mechatronics Applied to Fluid Film Bearings: Towards More Efficient Machinery (December 2012)

S150. SCHLECHTINGEN, MEIK: A Global Condition Monitoring System for Wind Turbines (February 2013)

S151. SENG, SOPHEAK: Slamming and Whipping Analysis of Ships (December 2012)

S152. HOSSEINZADEH, ELHAM: Fuel Cell Hydrogen manifold for Lift Trucks (December 2012)

S153. DIMITROV, NIKOLAY: Structural Reliability of wind Turbine Blades: Design Methods and Evaluation (February 2013)

S154. RABBANI, ABID: Dynamic Performance of a PEM Fuel Cell System (March 2013)

S155. LINDBERG, OLE: Multiscale Simulation of Breaking Wave Impacts (March 2012)

S156. NIELSEN, MARTIN BJERRE: Dynamics of Rigid Bodies and Flexible Beam Structures (September 2013)

S157. JENSEN, MICHAEL V.: Heat Transfer in Large Two-Stroke Marine Diesel Engines (August 2012)

S158. TORRY-SMITH, JONAS MØRKEBERG: Designing Mechatronic Products – Achieving Integration by Means of Modelling Dependencies (February 2013)

S159. POULIOS, KONSTANTINOS: Tribology of A Combined Yaw Bearing and Brake for Wind Turbines (September 2013)

S160. JØRGENSEN, MARTIN FELIX: Aerodynamic and Mechanical System Modelling (November 2013)

S161. ROTHUIZEN, ERASMUS DAMGAARD: Hydrogen Fuelling Stations – A Thermodynamic Analysis of Fuelling Hydrogen Vehicles for Personal Transportation (September 2013)

S162. WÖRÖSCH, MICHAEL: End-to-end requirements management for multiprojects in the construction industry (February 2014)

S163. BUREAU, EMIL: Experimental Bifurcation Analysis Using contro-Based continuation (January 2014)

S164. VAJARI, DANIEL ASHOURI: Micromechanical failure in fiber-reinforced composites (March 2014)

S165. JOHANSEN, AXEL OHRT: Numerical study of evaporators in power plants for improved dynamic flexibility (March 2013)

S166. ANDERSEN, INGRID MARIE VINCENT: Full Scale Measurements of the Hydro-Elastic Response of Large Container Ships for Decision Support (April 2014)

S167. GIVERSEN, SØREN: Blast Testing and Modelling of composite Structures (March 2014)

S168. SAREMI, SINA: Density-Driven Currents and Deposition of Fine Materials (April 2014)

S169. CERULLO, MICHELE: Computational stress and damage modelling for rolling contact fatigue (September 2014)

S170. NGUYEN, TUONG-VAN: Modelling, analysis and optimization of energy systems on offshore platforms (October 2014)

S171. AMINI AFSHAR, MOSTAFA: Towards Predicting the Added Resistance of Slow Ships in Waves (October 2014)

S172. ANDREASSEN, ERIK: Optimal Design of Porous Materials (January 2015)

S173. JOHANSEN, VILLADS EGEDE: Structural colours and applications to anodized aluminium surfaces (November 2014)

S174. BRUUN, HANS PETER LOMHOLT: PLM support to architecture based development – Contribution to computer-supported architecture modelling (January 2015)

S175. FUGLEDE, NIELS: Kinematics and Dynamics of Roller Chain Drives (July 2014)

S176. LARSEN, ULRIK: Design and modelling of innovative machinery systems for large ships (October 2014)

S177. LARSEN, JON STEFFEN: Nonlinear Analysis of Rotors Supported by Air Foil Journal Bearings – Theory & Experiments (February 2015)

S178. INGVORSEN, KRISTIAN MARK: Investigations of the turbulent swirling flow in a two-stroke marine diesel engine (November 2013)

S179. ERIKSEN, RASMUS NORMANN: High Strain Rate characterization of Composite materials (March 2014)

S180. PEDERSEN, BENJAMIN PJEDSTED: Data-driven Vessel Performance Monitoring (June 2014)

S181. JANAKIRAMAN, SHRAVAN: Fatigue and Wer in Rolling and Sliding Contacts (November 2014)

S182. CHRISTIANSEN, NIELS HØRBYE: Hybrid Method Simulation of Slender Marine Structures (August 2014)

S183. PIEROBON, LEONARDO: Novel design methods and control strategies for oil and gas offshore power systems (October 2014)

S184. DOU, SUGUANG: Gradient-based optimization in nonlinear structura dynamics (April 2015)

S185. CORDTZ, RASMUS FAURSKOV: The Influence of Fuel Sulfur on the Operation of Large Two-Stroke Marine Diesel Engines (January 2014)

S186. JEPSEN, ALLAN DAM: ARCHITECTURE DESCRIPTIONS – A contribution to Modeling of Production System Architecture (September 2014)

S187. OMMEN, TORBEN SCHMIDT: Heat Pumps in CHP Systems. High-efficienty Energy System Utilising Combined Heat and Power and Heat Pumps (April 2015)

S188. MODI, ANISH: Numerical evaluation of the Kalina cycle for concentrating solar power plants (August 2015)

S189. ENEMARK, SØREN: Integration of shape Memory Alloys into Low-Damped Rotor-Bearing Systems – Modelling, Uncertainties and Experimental Validation (October 2015)

S190. WRONSKI, JORRIT: Design and Modelling of Small Scale Low Temperature Power Cycles (May 2015)

S191. ANDERSEN, FREDERIK HERLAND: Integrated Analysis of the Scavenging Process in Marine Two-Stroke Diesel Engines (August 2015)

S192. GUOLAUGSSON, TÓMAS VIGNIR: Modelling architectures in multi-product oriented technology development (July 2015)

S193. CHRISTIANSEN, CHRISTIAN KIM: Diesel Engine Tribology (December 2015)

S194. COSTACHE, ANDREI: Anchoring FRP Composite Armor in Flexible Offshore Riser Systems (October 2015)

S195. COUTURIER, PHILIPPE JACQUES: Structural modelling of composite beams with application to wind turbine rotor blades (January 2016)

S196. VÁSQUEZ, FABIÁN GONZALO PIERART: Model-Based Control Design for flexible Rotors Supported by Active Gas Bearings - Theory & Experiment (January 2016)

S197. MAZZUCCO, ANDREA: Tank designs for combined high-pressure gas and solid-state hydrogen storage (January 2016)

S198. HEJLESEN, MADS MØLHOLM: A high order regularisation method for solving the Poisson equation and selected applications using vortex methods (February 2016)

S199. ÓLAFSSON, ÖLAFUR MAGNÚS: Improved Design Basis of Welded Joints in Seawater (March 2016)

S200. PARSLOV, JAKOB FILIPPSON: Defining Interactions and Interfaces in Engineering Design (March 2016)

S201. FRANDSEN, NIELS MORTEN MARSLEV: Design of advanced materials for linear and nonlinear dynamics (April 2016)

S202. MONTAZERI, NAJMEH: Estimation of waves and ship responses using onboard Measurements (March 2016)

S203. BRODERSEN, MARK LAIER: Damping of Wind turbine tower vibrations (December 2015)

S204. MANCA, MARCELLO: Fracture Characterization of Sandwich Face/Core Interfaces (March 2015)

S205. ANDERSEN, JAKOB BEJBRO: PSS Support for Maritime Technology Ventures: From Exploration to Methodology and Theory (November 2015)

S206. MOUGAARD; KRESTINE: A framework for conceptualisation of PSS solutions: On network-based development models (January 2016)

S207. JENSEN, JONAS KJÆR: Industrial heat pumps for high temperautre process applications - A numerical study of the ammonia-water hybrid absorption-compression heat pump (December 2015)

S208. CHRISTIANSEN, RASMUS E.: Topology Optimization for Wave Propagation Problems with Experimental Validation (June 2016)

S209. NEUMEYER, STEFAN: Macromechanical Parametric Amplification (April 2016)

S210. MADSEN, STINE SKOV: Dynamic Modeling of Pavements with Application to Deflection Measurements (July 2016)

S211. SALAZAR, JORGE ANDRÉS GONZÁLEZ: Towards Model-Based Control Design for Flexible Rotors Supported by Active Tilting Pad Bearings - Theory & Equipment (August 2016)

S212. VOIGT, ANDREAS JAUERNIK: Towards Identification of Rotordynamic Properties for Seals in Multiphase Flow Using Active Magnetic Bearings. Design and Commissioning of a Novel Test Facility (June 2016)

S213. EL-NAAMAN, SALIM ABDALLAH: Miro-Structural Evolution and Size-Effects in Plastically Deformed Single Crystals - Strain Gradient Continuum Modeling (July 2016)

S214. CLAUSEN, ANDERS: Topology Optimization for Additive Manufacturing (September 2016)

S215. RAVN, POUL MARTIN: Coherent Architecture Development as a Basis for Technology Development (December 2015)

S216. ALEXANDERSEN, JOE: Efficient topology optimisaton of multiscale and multiphysics problems (September 2016)

S217. KONTOS, STAVROS: Robust Numerical Methods for Nonlinear Wave-Structure Interaction in a Moving Frame of Reference (August 2016)

S218. LYTCHKE-JØRGENSEN, CHRISTOFFER: Design and optimization of flexible multi-generation systems (April 2016)

S219. CHRISTENSEN, MARTIN EBRO: Applying Robust Design in an Industrial Context (August 2015)

S220. HØGH, JACOB HEROLD: Hybrid Simulation of Composite Structures (January 2016)

S221. NIELSEN, BO BJERREGAARD: Combining Gas Bearing and Smart Material Technologies for Improved Machine Performance Theory and Experiment (July 2016)

S222. OBEIDAT, ANAS: Development of Smoothed Particle Hydrodynamics for flow in Complex Geometries and Application of Open Source Software for the Simulation of Turbulent Flow (June 2014)

S223. REGENER, PELLE BO: Hull-Propeller Interaction and Its Effect on Propeller Cavitation (November 2016)

S224. GÖHLER, SIMON MORITZ: Metric-driven Robust Design – Robustness Quantification of Complex Engineering Systems (February 2017)

S225. LAURIDSEN, JONAS: Control design of Active Magnetic Bearings for Rotors Subjected to Destabilising Seal Forces Theory & Experiment (May 2017)

S226. WESTLYE, FREDRIK REE: Experimental Study of Liquid Fuel Spray Combustion (June 2016)

S227. SIGURJONSSON, HAFTHOR ÆGIR: Modeling and Evaluation of Bioenergy and Agriculure system Integration (January 2016)

S228. LINHARES DA FONSECA, CESAR AUGUSTO LAMPE: A theoretical-experimental study of backup bearings – The pinned vs ball bearing (July 2017)

S229. KERMANI, NASRIN ARJOMAND: Design and prototyping of an ionic liquid piston compressor as a new generation of compressor for hydrogen refueling stations (May 2017)

S230. NØRGAARD, SEBASTIAN ARLUND: Topology optimization and lattice Boltzmann methods (October 2017).

S231. BAJRIĆ-HODŽIĆ, ANELA: Identification of damping from structural vibrations (October 2017)

S233. PEDERSEN, SØREN NYGAARD: Perceptual Robust Design (January 2017)

S234. NELLEMANN, CHRISTOPHER: Micro-structural evolution in plastically deformed crystalline materials (December 2017)

S235. BÜHLER, FABIAN: Energy efficiency in the industry: A study of the methods, potentials and interactions with the energy system (March 2018)

S236. BOORLA, SRINIVAS MURTHY: Zero Variation Manufacturing (ZVM) – A strategy for robust products with zero perceivable variation (January 2018)

S237. MARGALIT, JONATAN: Development of matural seabed forms and their interaction with offshore wind farms (Devember 2017)

S238. TIDEMANN, LASSE: Cyclic Yielding of Tubular Structures (January 2018)

S239. KJÆR, LOUISE LAUMANN: Environmental Impacts of Product/Service-Systems – broadening the life cycle assessment methodology (January 2018)

S240. KLIEM, MATHIAS: Damping of Composite Mast Structures (March 2018)

S241. SASEENDRAN, VISHNU: Fracture Chracterizatio and Analysis of Debonded Sandwich Composites (December 2017)

S242. PAGOROPOULOS, ARIS: Product/service systems in the maritime industry – from economic evaluation throughout the life sycle to implementation (September 2017)

S243. REBOUCAS, GERALDO FRANCISCO DE SOUZA: Vibro – Impact Mechanics. Analytical, Numerical and Experimental Investigations (September 2018)

S244. LØKKEGAARD, MARTIN: Top-Down Financially Driven Modularization (October 2017)

S245. LUNDGAARD, CHRISTIAN: Topology Optimization for multiphysics problems: Thermoelectric energy conversion and fluid-structure-interaction (June 2018)

S246. DAGNÆS-HANSEN, NIKOLAJ A.: Magnetic Bearings for Offshore Flywheel Energy Storage Systems (July 2018)

S247. JUUL, KRISTIAN JØRGENSEN: Steady-state and self-similar solution techniques in solid mechanics (August 2018)

S248. SPIETZ, HENRIK JUUL: A Vortex-particle Mesh Method for Large Eddy Simulation of Bluff Body Aerodynamics (June 2018)

S249. CHOI, JU-HYUCK: Efficient Estimation of Extreme Roll Motion of Ships (October 2018)

S250. OVERGAARD, HANNIBAL TOXVÆRD: Lubricant Transport across Piston Rings in large Two-Stroke Diesel Engines – Theory and Experiments (September 2018)

S251. MERONI, ANDREA: Design and Optimization of Turbomachinery for Thermodynamic Cycles Utilizing Low-Temperature Heat Sources (May 2018)

S252. RODRIGUES, VINIVIUS PICANÇO: “In search of gold”: measuring performance and evaluating potential business benefits of eco-design (July 2018)

S253. FARSHIDI, ARASH: Disbond Damage in Aircraft Sandwich Structures (January 2019)

S254. GROEN, JEROEN PETER: Multi-scale design methods for Topology Optimization (December 2018)

S255. BJARKLEV, KRISTIAN: Mode of Action-Based Variation Risk Identification (December 2018)

S256. JENSEN, LASSE SKOVGAARD: Design by Prototypin in Hardware Start-ups (October 2018)

S257. FERRUZZA, DAVIDE: Design of steam generator systems for concentrating solar power plants (October 2018)

S258. MIRSADRAEE, YASAMAN: Development of a Model for Propeller Tip Vortex Caviation and Analysis of the Radiated Pressure Fluctuations (September 2018)

S259. KARVOUNIS, NIKOLAS: Numerical Simulation of The Hydrodynamic Behavior of the Lubricant Oil Film in Large Two-stroke Marine Diesel Engines (October 2018)

S260. MANOUCHEHR MEHRTASH: Composite Materials for Electrical Transmission Mast Structures (February 2019)

S261. ZÜHLSDORF, BENJAMIN: High-performance heat pump systems. Enhancing performance and range of heat pump systems for industry and district heating (May 2019)

S262. YAACOB, MOHD RUSDY BIN: State-of-the-art laser Doppler systems development for turbulence measurements (June 2019)

S263. HOFFMEYER, DAVID: Damping of Torsional Beam Vibrations (August 2019)

S264. MØLLER, RANDI NØHR: Aerodynamic Stabilit of Long Span Bridges (June 2018)

S265. LUKASSEN, TROELS VESTERGAARD: Constitutive Behavior of Tensile Armor Wires in Unbounded Flexible Pipes (February 2019)

S266. ASADZADEH, SEYED SAEED: Numerical and experimental study of flow in choanoglagellates and choanocytes (August 2019)

S267. GOTFREDSEN, ERIK: Flow Phenomena in Selective Catalytic Reduction Systems used in Large Two-stroke Marine Diesel Engines (November 2018)

S268. MANCINI, ROBERTA: Design and Performance Analysis of Plate Heat Exchangers for Heat Pumps using Pure and Mixed Refrigerants (May 2019)

S269. TOFTEKÆR, JOHAN FREDERIK: Resonant Piezoelectric Shunt Damping of Structures (September 2019)

## 9. OTHER THESES

ANCHOUR, SOUFIAN BEN: “Towards Deterministic Micro Polishing”, DTU Mechanical Engineering, 2019, PhD Thesis.

ARADOTTIR, TINNA BJORK: “An Adaptive Model Based Approach to Personalized Basal Insulin Initiation I Type 2 Diabetes”, DTU Compute, 2019, PhD Thesis.

BARUFFI, FEDERICO: “Integrated micro product/process quality assurance in micro injection moulding production”, DTU Mechanical Engineering, 2019, PhD Thesis

BONABI, FARZAD: “Optical properties of one-dimensional Semiconductors: Franz-Keldysh and excitonic effects”, Aalborg University, Department of Mateirals and Production, 2019, PhD Thesis.

CANNELLA, EMANUELE: “High precision tooling for electrical sintering of titanium and permanent magnets”, DTU Mechanical Engineering, 2019, PhD Thesis

CHRISTENSEN, ESBEN TOKE: “Exploring the Viability of Meta-Models for Fast and Accurae Prediction of the Behaviour of Variable Shape Mould Systems”, Aalborg University, Department of Mateirals and Production, 2019, PhD Thesis.

DHAR, SOMRITA: “Microstructures and Fatigue Properties of Railway Steels for Switches and Crossings” DTU Wind Energy, 2019, PhD Thesis.

DIEDERICHS, ANNIKA MARTINA: “Structural Reorganization during Cuclic Deformation”, DTU Mechanical Engineering, 2019, PhD Thesis.

DOUGAOU-RAD, SAEED: “Experimental and Numerical Characterization of Nanofiller Reinforced Polymers for Thin-Walled Micro Component”, DTU Mechanical Engineering, 2019, PhD Thesis.

FEDOROVA, IRINA: “Alloy development for high Cr martensitic steel”, DTU Mechanical Engineering, 2019, PhD Thesis.

FISKER, ANN-SOFIE: “Surface design and rationalization for robotic hot-blade cutting”, DTU Compute, 2019, PhD Thesis.

GIANNEKAS, NIKOLAOS: “Precision Injection Moulding of Micro Features using Integrated Process/Product Quality Assurance”, DTU Mechanical Engineering, PhD Thesis.

HANSEN, ANDERS BAU: “Mechanica of thin-walled steel frames”, DTU Civil Engineering, 2019, PhD Thesis.

HANSEN, SØREN GUSTENHOFF: "Influence of Alkali-Silica Reaction on the Shear Capacity of Reinforced Concrete Slabs Without Shear Reinforcement", SDU, Department of Technology and Innovation, 2019, PhD Thesis.

HAVE, JONAS: “Excitonic properties of low-dimensional semiconductors: Magnetisk field effects and impurity bound excitions”, Aalborg University, Department of Mateirals and Production, 2019, PhD Thesis.

HEIDE-JØRGENSEN, SIMON: “Mechanics and Failure of Structured Interfaces”, Aarhus University, Department of Engineering, 2019, PhD Thesis.

HOFSTÄTTER, THOMAS: “Additive Manufacturing of Fiber-Reinforced Polymers”, DTU Mechanical Engineering, 2019, PhD Thesis.

JOSHY, SALIL: “Humidity control inside electronic Enclosures: Developing design principles based on empirial understanding”, DTU Mechanical Engineering, 2019, PhD Thesis.

JUNKER, RUNE GRØNBORG: “Characterisation and Integration of Energy Flexibility using Stochastic Modelling and Control”, DTU Compute, 2019, PhD Thesis.

KÜCÜKYILDIZ, ÖMER CAN: “The role of reaction kinetics and mechanical anisotropy during thermochemical surface engineering of stainless steel: a modelling and experimental assessment”, DTU Mechanical Engineering, PhD Thesis.

LAUSTSEN JENSEN, MATHIAS: “New production paradigms for wind turbines”, DTU Mechanical Engineering, 2019, PhD Thesis.’’

LEDET, LASSE SØGAARD: “A Novel Method for Solving Problems in Linear Dynamics Using Bi-Orthogonality Relations”, Aalborg University, Department of Mateirals and Production, 2019, PhD Thesis.

LI, DONGYA: “Process chains to manufacture micro structures on 3D surfaces of tools for replication”, DTU Mechanical Engineering, 2019, PhD Thesis.

LI, XUERONG: “Design and control modeling of novel electro-magnets driven spherical modtion generators”, Aalborg University, Department of Mateirals and Production, 2019, PhD Thesis.

LIU, HAILIANG: “Future highly renewable Chinese energy systems: fundamentals and techno-economic design”, Aarhus University, Department of Engineering, 2019, PhD Thesis.

MALEDE, YOHANES CHEKOL: “Effects of precipitation reactions on KCI induced high temperature corrosion”, DTU Mechanical Engineering, 2019, PhD Thesis.

MOGHADAM, MARCEL: “Limits of lubrication in severe stamping operations”, DTU Mechanical Engineering, 2019, PhD Thesis.

MORTENSEN, STEFFEN TRAM: “Qualifications for Virtual Commissioning”, Aalborg University, Department of Mateirals and Production, 2019, PhD Thesis.

MORTENSEN, ULRICH ANDREAS: “Process Paramters and Fatigue Properties of High Modulus Composites”, DTU Wind Energy, 2019, PhD Thesis.

REGI, FRANCESCO: “Process technologies for functional anisotropic surfaces generation in Quick Response Code applications”, DTU Mechanical Engineering, 2019, PhD Thesis

REVEKO, VALERIIA: “Development of new decorative nickel-like coating systems for indoor use”, DTU Mechanical Engineering, 2019, PhD Thesis.

RINGGAARD, KASPER: “Virtual Machining in the Innomill Project Structural dynamics model validation and machining process optimization”, Aarhus University, Department of Engineering, 2019, PhD Thesis.

SAXENA, PRATEEK: “Tooling for Green Fiber Molding”, DTU Mechanical Engineering, 2019 PhD Thesis.

SUN, TAO: “Vibration Control of Wave Energy Point Absorbers for Optimal Power Take-off”, Aalborg University, Department of Civil Engineering, 2019, PhD Thesis.

SØRENSEN, DANIEL G.H.: “Developing Manufacturing System Platform”, Aalborg University, Department of Mateirals and Production, 2019, PhD Thesis.

THIBBOTUWAWA, AMILA: “Unmanned Aerial Vehicle Fleet Mission Planning”, Aalborg University, Department of Mateirals and Production, 2019, PhD Thesis.

VILLADSEN, SEBASTIAN NIS-BAY: “A novel Electroscrubling Process for Gas Cleaning”, DTU Mechanical Engineering, 2019, PhD Thesis.

WESTERGAARD, THOMAS: “Modelling the load-carrying capacity of reinforced concrete slab bridges with focus on slab bridges constructed with inverted T-beams”, DTU Civil Engineering, 2019, PhD Thesis.

# 10. DCAMM COURSES GIVEN IN 2019

## DTU Mechanical Engineering

High Performance Computing: FORTRAN, OpenMP and MPI
Advanced Engineering Thermodynamics
Topology Optimization – Theory, Methods and Applications
PhD course on application of x-ray diffraction in materials science
Nanotribology: Theory and application
Measurement uncertainty estimation using statistical methods

## DTU Compute

PhD course on Vorticity, Vortical Flows and Vortex-Induced Vibrations (together with DTU Wind Energy

## APPENDIX: List of members 2019

Abbreviations:

from Technical University of Denmark

CIVIL: Dept. of Civil Engineering
COMPUTE: Dept. of Applied Mathematics and Computer Science
MEK-FAM: Dept. of Mechanical Engineering, Solid Mechanics
MEK-FVM: Dept. of Mechanical Engineering, Fluid Mechanics, Coastal and Maritime Engineering
MEK-K&P: Dept. of Mechanical Engineering, Engineering Design and Product Development
MEK-MPP: Dept. of Mechanical Engineering, Manufacturing Engineering
MEK-MTU: Dept. of Mechanical Engineering, Materials and Surface Engineering
MEK-TES: Dept. of Mechanical Engineering, Thermal Energy
WIND: DTU Wind Energy

from Aalborg University

BUILD, AAU: Department of the Built Environment
MATH, AAU: Department of Mathematical Sciences
MECH, AAU: Department of Materials and Production

from Aarhus University

ENG, AU: Department of Engineering

from University of Southern Denmark

SDU-ITI: Dept. of Technology and Innovation

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|---|---|---|
| Abbiati, Giuseppe | (ENG, AU) | Assistant Professor |
| Abrahamsen, Asger | (WIND) | Senior Researcher |
| Achour, Soufian Ben | (MEK-MPP) | PhD student |
| Aghababaei, Ramin | (ENG, AU) | Assistant Professor |
| Akbar, Mahdi | (ENG, AU) | Assistant Professor |
| Alexandersen, Joe | (SDU-ITI) | Assistant Professor |
| Alibrandi, Umberto | (ENG, AU) | Associate Professor |
| Alting, Leo | (MEK-MPP) | Professor Emeritus |
| Ambat, Rajan | (MEK-MTU) | Professor |
| Anchondo, Ruben Isaac Erives | (WIND) | PhD student |
| Andersen, Asger Gade | (MEK-MTU) | PhD student |
| Andersen, Lars Vabbersgaard | (ENG, AU) | Professor, PhD |
| Andersen, Michael Skipper | (MECH, AAU) | Associate Professor |
| Andersen, Mikkel | (MATH, AAU) | Associate Professor |
| Andersen, Morten Nørgaard | (MEK-FAM) | PhD student |
| Andersen, Poul | (MEK-FVM) | Associate Professor |
| Andersen, Rasmus Grau | (MEK-FAM) | PhD student |
| Andersen, Sebastian Aagaard | (MEK-MPP) | PhD student |
| Andersen, Søren Juhl | (WIND) | Associate Professor |
| Andersen, Søren Rindom | | Elected member, PhD |

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|---|---|---|
| Andreasen, Casper Schousboe | (MEK-FAM) | Associate Professor |
| Andreasen, Jens H. | (MECH, AAU) | Associate Professor, PhD |
| Andreasen, Jesper Graa | (MEK-TES) | PhD student |
| Andreasen, Mogens Myrup | (MEK-K&P) | Professor Emeritus |
| Andreassen, Michael Joachim | (CIVIL) | Associate Professor |
| Andresen, Gorm Bruun | (ENG, AU) | Asstistant Professor |
| Andrillo, Tito | (MEK-MPP) | Postdoc |
| Arlitt, Ryan Michael | (MEK-K&P) | Assistant Professor |
| Arora, Vikas | (SDU-ITI) | Associate Professor |
| Askhøj, Christoffer | (MEK-K&P) | PhD student |
| Azizi, Reza | | Elected member, PhD |
| Baars, Woutjin J. | (ENG, AU) | Assistant Professor |
| Bahenscheer, Mathias Malmkvist | (MEK-K&P) | Scientific Assstant |
| Bahrebar, Saijad | (MEK-MTU) | PhD student |
| Bai, Shaoping | (MECH, AAU) | Associate Professor |
| Bak, Brian Lau Verndal | (MECH, AAU) | Assistant Professor |
| Baldasso, Enrico | (MEK-TES) | PhD student |
| Balling, Ole | (ENG, AU) | Aff. Professor |
| Bangaru, Ashish Kumar | (WIND) | PhD student |
| Baruffi, Federico | (MEK-MPP) | PhD student |
| Basso, Alberto | (MEK-MPP) | Scientific Assistant |
| Bay, Niels O. | (MEK-MPP) | Professor Emeritus |
| Bayat, Mohamad | (MEK-MPP) | PhD student |
| Beelen, Peter | (COMPUTE) | Professor MSO |
| Bender, Jens Jakob | (MECH, AAU) | Postdoc |
| Bendsøe, Martin | | Elected member, Professor Emeritus, dr. techn. |
| Bentzon, Jakob Roar | (MEK-FVM) | PhD student |
| Benzon, Tomas | (MEK-K&P) | Architect |
| Bergamini, Riccardo | (MEK-TES) | PhD student |
| Berggreen, Christian | (MEK-FAM) | Associate Professor |
| Berntsen, Jesper | (SDU-ITI) | PhD student |
| Bertram, Christian Alexander | (MEK-K&P) | PhD student |
| Bibbo, Nimai Domennico | (SDU-ITI) | PhD student |
| Bingham, Harry B. | (MEK-FVM) | Professor |
| Biondani, Francesco G. | (MEK-MPP) | Postdoc |
| Bisacco, Giuliano | (MEK-MPP) | Associate Professor |
| Bjerregård, Mathias Blicher | (COMPUTE) | PhD student |
| Blomgren, Emma Margareta Viktoria | (COMPUTE) | PhD student |
| Blomsma, Fenna | (MEK-K&P) | Postdoc |
| Bluhm, Gore Lukas | (MEK-FAM) | PhD student |
| Boccia, Rossana | (MEK-TES) | PhD student |
| Bohr, Thomas | | Elected member, Professor |
| Borg, Ulrik | | Elected member, Senior Engineer |
| Bræstrup, M. W. | | Elected member, PhD |
| Brander, David | (COMPUTE) | Associate Professor |
| Brandt, Anders | (SDU-ITI) | Associate Professor |
| Branner, Kim | (WIND) | Senior Researcher |
| Bräuner, Lars | (ENG, AU) | Associate Professor |
| Bredmose, Henrik | (WIND) | Professor |
| Brilhuis-Meijer, Ellen | (MEK-K&P) | PhD student |
| Brockhoff, Per B. | (COMPUTE) | Head of Department, Professor |
| Brok, Niclas Lauersen | (COMPUTE) | PhD student |
| Brøns, Marie | (MEK-FAM) | PhD student |
| Brøns, Morten | (COMPUTE) | Professor, PhD |
| Bucinskas, Paulius | (ENG, AU) | PhD student |
| Budden, Christian Leslie | (MEK-MPP) | Scientific Assistens |

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|---|---|---|
| Budzik, Michal | (ENG, AU) | Assistant Professor |
| Buhl, Thomas | | Elected member, PhD |
| Bühler, Fabian | (MEK-TES) | Postdoc |
| Butera, Giacomo | (MEK-TES) | PhD student |
| Calaon, Matteo | (MEK-MPP) | Researcher |
| Campo Muga, Ruben del | (MEK-MTU) | Postdoc |
| Carlsen, Henrik | (MEK-TES) | Professor Emeritus |
| Carreras, Laura | (MECH, AAU) | Postdoc |
| Carstensen, Stefan | (MEK-FVM) | Associate Professor |
| Castro Ardilla, Oscar Gerardo | (WIND) | PhD student |
| Castro, Miguel Nobre | (MECH, AAU) | PhD student |
| Cederkvist, Jan | | Elected member, PhD. |
| Cederlöf, Daan Jonas Hottentot | (WIND) | PhD student |
| Checchi, Alessandro | (MEK-MPP) | PhD student |
| Chen, Xiao | (WIND) | Researcher |
| Chivaee, Hamid Sarlek | (WIND) | Assistant Professor |
| Christensen, Carsten Keinicke Fjord | (MEK-K&P) | PhD student |
| Christensen, Erik Damgaard | (MEK-FVM) | Professor, Head of Section |
| Christensen, Ole | (COMPUTE) | Professor, dr.scient. |
| Christensen, Silas Sverre | (SDU-ITI) | PhD student |
| Christiansen, Christian Kim | | Elected member, PhD. |
| Christiansen, Jesper De Claville | (MECH, AAU) | Professor |
| Christiansen, Ramus Ellebæk | (MEK-FAM) | Postdoc |
| Christiansen, Thomas Lundin | (MEK-MTU) | Associate Professor |
| Ciucani, Umberto Maria | (MEK-MTU) | PhD student |
| Clausen, Johan Christian | (ENG, AU) | Associate Professor |
| Clausen, Lasse Røngaard | (MEK-TES) | Associate Professor |
| Comminal, Raphael Benjamin | (MEK-MPP) | Researcher |
| Conlan-Smith, Cian | (MEK-FAM) | PhD student |
| Conti, Davide | (WIND) | PhD student |
| Cordtz, Rasmus Faurskov | (MEK-TES) | Researcher |
| Cornean, Horia | (MATH, AAU) | Professor |
| Criscuolo, Gennaro | (MEK-TES) | PhD student |
| Dahl, Kristian Vinter | (MEK-MTU) | Senior Researcher |
| Dahmen, Thomas | (MEK-MPP) | PhD student |
| Damkilde, Lars | (BUILD, AAU) | Professor |
| Dammann, Bernd | (COMPUTE) | Associate Professor |
| Danielak, Anna Halina | (MEK-MPP) | Scientific Assistant |
| Danielsen, Hilmar K. | (WIND) | Senior Researcher |
| Darula, Radoslav | (MECH, AAU) | Assistant Professor |
| Davoudinejad, Ali | (MEK-MPP) | Postdoc |
| De Baere, David | (MEK-MPP) | PhD student |
| De Chiffre, Leonardo | (MEK-MPP) | Professor |
| Deininger, Michael | (MEK-K&P) | Associate Professor |
| Desai, Nishith Babubhai | (MEK-TES) | Postdoc |
| Dias, Marcelo | (ENG, AU) | Assistant Professor |
| Diederichs, Annika Martina | (MEK-MTU) | PhD student |
| Dilgen, Cetin | (MEK-FAM) | PhD student |
| Dimitrov, Nikolai | (WIND) | Senior Researcher |
| Drozdov, Aleksey | (MECH, AAU) | Professor |
| Eder, Martin Alexander | (WIND) | Senior Researcher |
| Eifler, Tobias | (MEK-K&P) | Assistant Professor |
| Elmegaard, Brian | (MEK-TES) | Professor, Head of Section |
| Eltard-Larsen, Bjarke | (MEK-FVM) | Postdoc |
| Endelt, Benny | (MECH, AAU) | Associate Professor |
| Engsig-Karup, Allan | (COMPUTE) | Associate Professor |
| Eriksen, Stig | (SDU-ITI) | PhD student |

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|---|---|---|
| Erlandsson, Anders Christiansen | (MEK-TES) | Professor mso |
| Evgrafov, Anton | (MEK-FAM) | Senior Researcher |
| Faber, Michael Havbro | (BUILD, AAU) | Professor |
| Fajstrup, Lisbeth | (MATH, AAU) | Associate Professor |
| Fang, Haixing | (MEK-MPP) | Postdoc |
| Fedorova, Irina | (MEK-MTU) | Scientific Assistant |
| Felter, Christian Lotz | | Elected member, PhD |
| Feng, Ju | (WIND) | Senior Researcher |
| Filsoof, Oliver Tierdad | (ENG, AU) | PhD student |
| Foldager, Frederik | (ENG, AU) | PhD student |
| Frederiksen, Trine Brink | (MEK-K&P) | Scientific Assistant |
| Fredsøe, Jørgen | (MEK-FVM) | Professor Emeritus |
| Frier, Christian | (BUILD, AAU) | Associate Professor, PhD |
| Fuentes, Valentin Salgado | (MEK-TES) | PhD student |
| Fuhrman, David R. | (MEK-FVM) | Associate Professor |
| Funch, Cecilie Vase | (MEK-MTU) | PhD student |
| Funk, Nicklas Chrisitan | (MEK-K&P) | Scientific Assistant |
| Gaikwad, Rohit Vilas | (MEK-MTU) | Postdoc |
| Gani, Michael | (MEK-FAM) | PhD student |
| Gao, Luyaoe | (MECH, AAU) | PhD student |
| Garcia, Néstor Ramos | (WIND) | Researcher |
| Garde, Henrik | (MATH, AAU) | Assistant Professor |
| Geiselhart, Matthias | (MEK-TES) | PhD student |
| Georgakis, Christos T. | (ENG, AU) | Professor |
| Ghadirian, Amin | (WIND) | Postdoc |
| Ghosh, Amartya | (MEK-K&P) | PhD student |
| Gisladottir, Arnthrudur | (ENG, AU) | PhD student |
| Goutianos, Stergio | (WIND) | Senior Scientist |
| Graeme, Keith | | Elected member |
| Gravesen, Jens | (COMPUTE) | Associate Professor, dr.phil |
| Greiner, Martin | (ENG, AU) | Professor |
| Groen, Jeroen Peter | (MEK-FAM) | Postdoc |
| Gull, Muhammad Ahsan | (MECH, AAU) | PhD student |
| Gullo, Paride | (MEK-TES) | Postdoc |
| Gunneskov, Ole | | Elected member, PhD. |
| Gupta, Kapil Kumar | (MEK-MTU) | PhD student |
| Gupta, Shivangi | (MEK-MTU) | PhD student |
| Haglind, Fredrik | (MEK-TES) | Associate Professor |
| Hald, John | (MEK-MTU) | Professor |
| Han, Anpan | (MEK-MPP) | Senior Researcher |
| Hansen, Camilla Arndt | (MEK-K&P) | PhD student |
| Hansen, Claus Thorp | (MEK-K&P) | Associate Professor |
| Hansen, Hans Nørgaard | (MEK-ADM) | Professor, Head of Department |
| Hansen, Kasper Barslund | (MEK-K&P) | Scientific Assistant |
| Hansen, Kurt Schaldemose | (WIND) | Senior Researcher |
| Hansen, Lile Thornfeldt | (MEK-MTU) | Scientific Assistant |
| Hansen, Martin Otto Laver | (WIND) | Associate Professor |
| Hansen, Per Chr. | (COMPUTE) | Professor, dr. techn. |
| Haratian, Saber | (MEK-MTU) | PhD student |
| Hassan, Hafiz Muhammad Adeel | (SDU-ITI) | PhD student |
| Hassing, Henrik | | Elected member, PhD |
| Hattel, Jesper Henri | (MEK-MPP) | Professor |
| Heide-Jørgensen, Simon | (ENG, AU) | Postdoc |
| Henrichsen, Søren Randrup Daugaard | | Elected member, PhD |
| Henriksen, Christian | (COMPUTE) | Associate Professor, PhD |
| Hicks, Jacob Bjarke Hansen | (MEK-FVM) | PhD student |
| Hjorth, Poul | (COMPUTE) | Associate Professor, PhD |

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|---|---|---|
| Hodzic, Azur | (MEK-FVM) | Postdoc |
| Høeg, Christian Elkjær | (ENG-AU) | PhD student |
| Hoffmeyer, David | (SDU-ITI) | Assistant Professor |
| Høgsaa, Bjarke Hangstrup | (MECH, AAU) | PhD student |
| Høgsberg, Jan Becker | (MEK-FAM) | Associate Professor |
| Højsgaard, Søren | (MATH, AAU) | Associate Professor, head of department |
| Holte, Ingrid | (MEK-FAM) | PhD student |
| Hong, Chuanshi | (MEK-MTU) | Senior Researcher |
| Huang, Xiaoxu | (MEK-MTU) | Senior Researcher |
| Ibsen, Lars Bo | (BUILD, AAU) | Professor, PhD |
| Islam, Mohammad Aminul | (MEK-MPP) | Associate Professor |
| Islam, Muhammad Raza Ul | (MECH, AAU) | PhD student |
| Ivarsson, Anders | (MEK-TES) | Associate Professor |
| Jacobsen, Christian Brix | | Elected member, PhD. |
| Jakobsen, Christian S. | | Elected member, R&D Engineer |
| Jakobsen, Johnny | (MECH, AAU) | Associate Professor |
| Jakobsen, Lasse | (MEK-MPP) | Scientific Assistant |
| Jelicic, Goran | (SDU-ITI) | PhD student |
| Jellesen, Morten Stendahl | (MEK-MTU) | Senior Researcher |
| Jensen, Dorte Juul | (MEK-MPP) | Professor |
| Jensen, Henrik Myhre | (ENG, AU) | Professor |
| Jensen, Jakob Søndergaard | (MEK-FAM) | Professor MSO, PhD |
| Jensen, Jonas Kjær | (MEK-TES) | Researcher |
| Jensen, Jørgen Juncher | (MEK-FVM) | Professor Emeritus, dr. techn. |
| Jensen, Lars Rosgaard | (MECH, AAU) | Associate Professor |
| Jensen, Michael Vincent | (MEK-TES) | Researcher |
| Jensen, Simon Mosbjerg | (MECH, AAU) | PhD student |
| Jensen, Stina Rask | (ENG, AU) | PhD student |
| Jespersen, Mads Carsten | (MEK-TES) | Scientific Assistant |
| Jönsson, Jeppe | (CIVIL) | Professor |
| Jørgensen, Jens Grandjean | | Elected member, PhD |
| Jørgensen, John Bagterp | (COMPUTE) | Associate Professor |
| Jørgensen, Pernille Hartmund | (MEK-TES) | Scientific Assistant |
| Junker, Rune Grønborg | (COMPUTE) | PhD student |
| Kærn, Martin Ryhl | (MEK-TES) | Senior researcher |
| Kain, Martin | (MEK-MPP) | PhD student |
| Karamehmedovic, Mirza | (COMPUTE) | Associate Professor |
| Kepler, Jørgen | (MECH, AAU) | Associate Professor |
| Kermani, Nasrin Arjomand | (MEK_TES) | Postdoc |
| Khalid, Waqas | (MEK-K&P) | PhD student |
| Khan, Daniyal | (SDU-ITI) | PhD student |
| Kiefer, Janik | (WIND) | PhD student |
| Kim, Taesong | (WIND) | Associate Professor |
| Kirkegaard, Poul Henning | (ENG, AU) | Professor |
| Kjeld, Jonas Gad | (SDU-ITI) | PhD student |
| Klahn, Mathias | (MEK-FVM) | PhD student |
| Klingaa, Christopher Gottlieb | (MEK-MPP) | PhD student |
| Klit, Peder | (MEK-FAM) | Professor, PhD |
| Knudsen, Jonas Emil Brønserud | (MEK-MPP) | Scientific Assistant |
| Knudsen, Kim | (COMPUTE) | Associate professor |
| Kofler, René | (MEK-TES) | PhD student |
| Körkel, Andreas F.K. | (MEK-MTU) | PhD student |
| Koss, Holger | (CIVIL) | Associate Professor |
| Kozarcanin, Smail | (ENG, AU) | PhD student |
| Kravchenko, Mariia | (MEK-K&P) | PhD student |
| Krenk, Steen | (MEK-FAM) | Professor Emeritus, dr.techn. |
| Kristiansen, Hansotto | (MEK-FAM) | PhD student |

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|---|---|---|
| Kristiansen, Kristian Uldall | (COMPUTE) | Associate Professor |
| Krüger, Kilian | (MEK-MPP) | PhD student |
| Kücükyildiz, Ömer Can | (MEK-MPP) | Postdoc |
| Kumar, Prabhat | (MEK-FAM) | Postdoc |
| Kumar,Rajnish | (WIND) | PhD student |
| Kværndrup, Frederik Bojsen | (MEK-MTU) | PhD student |
| Lakhtakia, Akhlesh | (MEK-K&P) | Guest Professor |
| Larsen, Jan Balle | | Elected member, PhD. |
| Larsen, Mikkel Løvenskjold | (SDU-ITI) | PhD student |
| Larsen, Poul Scheel | (MEK-FVM) | Professor Emeritus, PhD |
| Larsen, Raino Mikael | (MECH, AAU) | Associate Professor |
| Ledet, Lasse Søgaard | (MECH, AAU) | PhD student |
| Lee, Seunghwan | (MEK-MTU) | Associate Professor |
| Legarth, Brian N. | (MEK-FAM) | Associate Professor, PhD |
| Lemos, Simone de | (MEK-FVM) | ScientificAssistant |
| Lemvig, Jakob | (COMPUTE) | Associate Professor |
| Lenau, Torben Anker | (MEK-K&P) | Associate Professor |
| Leto, Harun | (MECH, AAU) | PhD student |
| Li, Dongya | (MEK-MPP) | Postdoc |
| Li, Feng | (MEK-MTU) | PhD student |
| Li, Xuerong | (MECH, AAU) | Phd student |
| Li, Zhongyi | (MECH-AAU) | PhD student |
| Lilholt, Hans | (WIND) | Chief Scientist |
| Liljenhjerte, Johannes | (ENG, AU) | PhD student |
| Limkilde, Asger | (COMPUTE) | PhD student |
| Lindgaard, Esben | (MECH, AAU) | Associate Professor |
| Lind-Nielsen, Birger | | Elected member, PhD. |
| Liu, Hailiang | (ENG, AU) | PhD student |
| Loaldi, Dario | (MEK-MPP) | PhD student |
| Luczak, Martin M. | (WIND) | Senior Researcher |
| Lund, Erik | (MECH, AAU) | Professor, PhD |
| Lund, Ivar | (SDU-ITI) | Associate Professor |
| Luongo, Andrea | (MEK-MPP) | Postdoc |
| Lützen, Marie | (SDU-ITI) | Associate Professor |
| Lynggaard, Julie | (MEK-FAM) | PhD student |
| Madsen, Bo | (WIND) | Senior Scientist |
| Madsen, Emil | (ENG, AU) | PhD student |
| Madsen, Freddy Johannes | (WIND) | PhD student |
| Madsen, Frederik Grønborg | (MEK-MPP) | Scientific Assistant |
| Madsen, Per A. | (MEK-FVM) | Professor, dr.techn. |
| Madsen, Søren Peder | (ENG, AU) | Associate Professor |
| Mahdavi, Hamidreza | (MEK-FAM) | PhD student |
| Mahdi, Abkar | (ENG, AU) | Assistant Professor |
| Mahshid, Rasoul | (MEK-MPP) | Researcher |
| Manouchehr, Mehrtash | (MEK-FAM) | Scientific Assistant |
| Mantis, Ioannis | (MEK-MTU) | Scientific Assistant |
| Markussen, Wiebke Brix | (MEK-TES) | Associate Professor |
| Markvorsen, Steen | (COMPUTE) | Professor, dr. techn., PhD |
| Martens, Erik Andreas | (COMOUTE) | Associate Professor |
| Marti, Ignacio | (WIND) | Head of Section |
| Matte, Oliver | (MATH, AAU) | Associate Professor |
| Mazuryn, Maksim | (COMPUTE) | PhD student |
| McAloone, Tim C. | (MEK-K&P) | Professor MSO |
| Meesenburg, Wiebke | (MEK-TES) | PhD student |
| Meng, Yichen | (MEK-MTU) | PhD student |
| Metze, Anna-Luise | (MEK-K&P) | Scientific Assistant |
| Meyer, Knud Erik | (MEK-FVM) | Associate Professor, PhD |

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|---|---|---|
| Mikkelsen, Henrik | (MEK-FVM) | PhD student |
| Mikkelsen, Lars Pilgaard | (WIND) | Associate Professor |
| Mikkelsen, Robert Flemming | (WIND) | Senior Researcher |
| Mishin, Oleg V. | (MEK-MTU) | Senior Researcher |
| Mishnaevsky, Leon | (WIND) | Senior Scientist, Dr.-ing.habil |
| Moghadam, Marcel | (MEK-MPP) | PhD student |
| Mohanty, Sankhya | (MEK-MPP) | Researcher |
| Molla, Md. Tusher | (MEK-MPP) | PhD student |
| Møller Andersen, Mads Emil | (CIVIL) | PhD student |
| Møller, Jesper | (MATH, AAU) | Professor |
| Moncy, Aakash | (MEK-FAM) | PhD student |
| Montagud, Maria Engracia Mondejar | (MEK-TES) | Researcher |
| Mortensen, Niels Henrik | (MEK-K&P) | Professor, Head of Section |
| Mozafari, Shadan | (WIND) | PhD student |
| Mulder, Hugo | (SDU-ITI) | Assistant Professor |
| Müller, Georg Otto | (MEK-K&P) | Scientific Assistant |
| Nadimpalli, Venkata Karthik | (MEK-MPP) | Postdoc |
| Natarajan, Anand | (WIND) | Senior Researcher |
| Nemeti, Arash | (MEK-FVM) | PhD student |
| Nerenst, Tim Brix | (MEK-FAM) | PhD student |
| Nguyen, Tuong-Van | (MEK-TES) | Researcher |
| Nielsen, Anne Ryelund | (COMPUTE) | PhD student |
| Nielsen, Chris Valentin | (MEK-MPP) | Associate Professor |
| Nielsen, Jacob Obitsø | (MEK-MTU) | PhD student |
| Nielsen, Jens Henrik | (CIVIL) | Assistant Professor |
| Nielsen, Kim Lau | (MEK-FAM) | Associate Professor |
| Nielsen, Leif Otto | (CIVIL) | Associate Prof. Emeritus |
| Nielsen, Morten | (MATH, AAU) | Professor |
| Nielsen, Niels-Jørgen Rishøj | | Elected member, PhD. |
| Nielsen, Søren R.K. | (BUILD, AAU) | Professor, dr. techn |
| Nielsen, Ulrik Dam | (MEK-FVM) | Associate Professor |
| Niordson, Christian F. | (MEK-FAM) | Professor, PhD, Head of Section |
| Nutakor, Charles | (WIND) | Postdoc |
| Nyborg, Camilla Marie | (WIND) | PhD student |
| Nygaard, Jens Vinge | (ENG, AU) | Head of Mechanical Engineering |
| Nzulumike, Achebe Niels Olesen | (MEK-MTU) | PhD student |
| Ohlsen, Niels Lennart | (SDU-ITI) | Assistant Professor |
| Oikonomakis, Angelos | (MEK-FVM) | PhD student |
| Okulov, Valery | (WIND) | Senior Researcher |
| Olesen, John Forbes | (CIVIL) | Associate Professor |
| Olhoff, Niels | (MECH, AAU) | Professor Emeritus |
| Oliveira, Anderson | (MECH, AAU) | Associate Professor |
| Ommen, Torben Schmidt | (MEK-TES) | Researcher |
| Ong, Jiun Cai | (MEK-FVM) | Postdoc |
| Ottosen, Emil Solsbæk | (MATH, AAU) | Assistant Professor |
| Özkil, Ali Gürcan | (MEK-K&P) | Associate Professor |
| Pantleon, Karen | (MEK-MTU) | Associate Professor |
| Pantleon, Wolfgang | (MEK-MTU) | Professor MSO |
| Paulsen, Thomas Thougaard | (MEK-FAM) | PhD student |
| Pawlowitz, Tobias | (SDU-ITI) | PhD student |
| Pedersen, David Bue | (MEK-MPP) | Senior Researcher |
| Pedersen, Lars | (BUILD, AAU) | Associate Professor |
| Pedersen, Michael | (COMPUTE) | Professor, dr.techn. |
| Pedersen, Mikkel Melters | (ENG, AU) | Assistant Professor |
| Pedersen, Niels L. | (MEK-FAM) | Associate Professor, dr.techn. |
| Pedersen, Pauli | (MEK-FAM) | Professor Emeritus, dr.techn., HD |
| Pedersen, Preben Terndrup | (MEK-FVM) | Professor Emeritus, PhD |

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|---|---|---|
| Pedersen, Thomas Ørts | | Elected member, PhD. |
| Peréz, Ignacio V. | (MEK-FAM) | PhD student |
| Perez, Marta Victoria | (ENG, AU) | Postdoctoral Researcher |
| Petersen, Henrik Gordon | | Elected member, Professor |
| Petersen, Thomas | | Elected member, PhD |
| Pieroni, Marina de Pádua Pinheiro | (MEK-K&P) | PhD student |
| Pigosso, Daniela Cristina Antelmi | (MEK-K&P) | Associate Professor |
| Poulios, Konstantinos | (MEK-FAM) | Researcher |
| Poulsen, Niels Kjølstad | (COMPUTE) | Associate Professor, PhD |
| Poulsen, Peter Noe | (CIVIL) | Associate Professor |
| Quagliotti, Danilo | (MEK-MPP) | Postdoc |
| Qwist, Jesper Roland Kjærgaard | (MEK-FVM) | PhD student |
| Rahmani, Shahrokh | (MEK-MPP) | Postdoc |
| Ranjbar, Navid | (MEK-MPP) | Postdoc |
| Rasmussen, Christoffer | (COMPUTE) | PhD student |
| Rasmussen, Filip Salling | (MEK-MPP) | PhD student |
| Rasmussen, Henrik K. | (MEK-MPP) | Associate Professor, PhD |
| Rasmussen, Jeppe Bredahl | (MEK-K&P) | PhD student |
| Rasmussen, John | (MECH, AAU) | Professor |
| Rasmussen, Morten Grud | (MATH, AAU) | Associate Professor |
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| Regi, Francesco | (MEK-MPP) | Scientific Assistant |
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| Ribo, Macarena Mendez | (MEK-MPP) | PhD student |
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| Røgen, Peter | (COMPUTE) | Associate Professor, PhD |
| Rogie, Brice Lucien Maurice | (MEK-TES) | Postdoc |
| Rokni, Marvin Mikael | (MEK-TES) | Associate Professor |
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| Sigmund, Ole | (MEK-FAM) | Professor, dr.techn. |

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| Situ, Wenfu | (MEK-FVM) | PhD student |
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| Sørensen, Jens Nørkær | (WIND) | Professor |
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