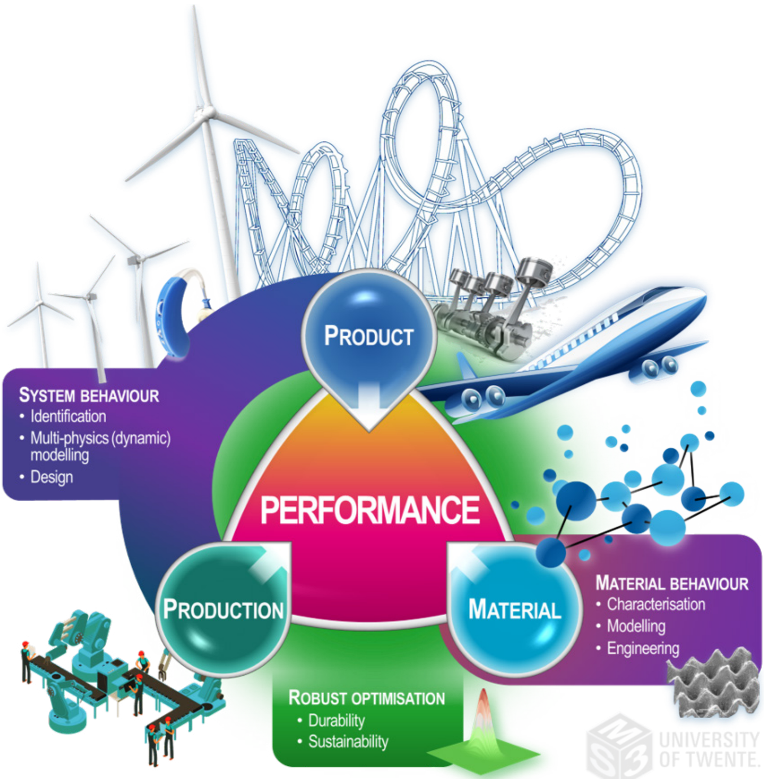
MSc SPECIALISATION MECHANICAL ENGINEERING

HIGH-TECH SYSTEMS & MATERIALS (HTSM)



UNIVERSITY OF TWENTE.

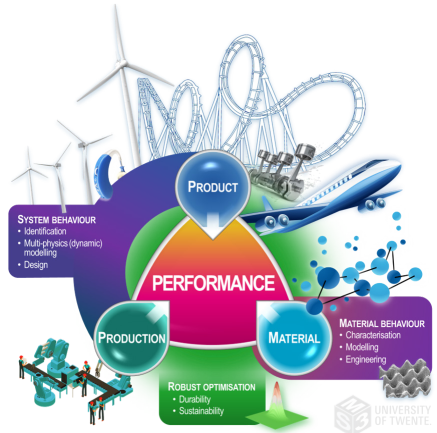
CONTENTS

HIGH-TECH SYSTEMS & MATERIALS

When developing, designing and producing new products, a mechanical engineer is confronted with mechanics, materials, control and processes.

This specialisation prepares you for a future career as a mechanical engineer (MSc) and includes an emphasis on mechanics, control, materials and processes. These skills are indispensable to create new materials (composites), products and manufacturing processes of tomorrow.

So, do you want to become a mechanical engineer and are you passionate about the behaviour of systems and materials used to develop products and manufacturing processes? Are you eager to contribute to the creation of new and optimized materials, products and machinery? Do you want to combine fundamental research with model-based design and immediate industrial application? Then the High-Tech Systems and Materials (HTSM) Master's specialisation is the perfect choice for you!



The HTSM specialisation will deepen and broaden your knowledge of the development, design, analysis and operational life of machinery, structures, products and production processes. In this sense, it is similar to the other ME specialisations. The main difference is that this specialisation focuses on the behaviour of, and the interaction between, components (materials) and processes.

THEMES

The specialisation High-Tech Systems and Materials is your best option if you want to learn how to put the properties and behaviour of single and interacting materials and systems to maximum industrial use. The specialisation covers four separate themes:

- Material behaviour and (nonlinear) solid mechanics (large deformation and uncertainties during production processes, and composites);
- Nonlinear dynamics (multibody dynamics, large motions of flexible bodies);
- System behaviour (control, dynamics, surface interface);
- Robust optimization and control of production processes (composite manufacturing, steel manufacturing processes).

Your tasks as an HTSM specialist can vary greatly. A few examples: from developing physics-based computing models and/or control algorithms for the design or optimisation of physical machines or systems, to designing a test rig for the validation of new products and identification of the causes of deviations in order to facilitate improvement, to finding out how solid material properties influence the feasibility of zero-defect production in a certain manufacturing process, to analysing data on the properties of new thermoplastic materials, and to analysing and controlling the dynamic behaviour of systems.

The products and manufacturing systems you will be trained to work with are often human-sized (microscopic to macroscopic). But as part of your underlying research, you will also deal with submicron-size features on material surfaces.

More details of themes, mentioned above, as well as examples, are discussed in more detail, in the following pages. You can go to the website of each research group by scanning the QR codes at the top of the pages.

AMDA

APPLIED MECHANICS AND DATA ANALYSIS

The research in Applied Mechanics and Data Analysis (AMDA) group is focused on the seamless integration of nonlinear physics based models with data. Our focus is on the nonlinear dynamics modelling of systems (structures), components and their elements, e.g. see Fig. 1. The special interest is paid to the rigid and soft body dynamics in robotics and high tech machines, as well as system/structural dynamics under presence of uncertainties and unknown interfaces (contact), see Fig. 2. These models are augmented with the variation of the design parameters aiming at the optimal design of systems/machines for mechanical safety. To predict aging of mechanical components, we focus on the modelling and experimental investigation of damage mechanisms happening on macro-, meso- and microstructural levels, see Fig. 1 and Fig. 4. As these are essentially characterized by variations that happen due to inability to fully control manufacturing process, we extend the dynamics models with nonlinear mechanical models augmented with uncertainty. The focus is on composite materials such as thermoplastic composite and concrete. The developed descriptions then also incorporate the lack of experts knowledge about the material/machine state or boundary/excitation conditions. Next to this, in our group we also have expertise on the active noise control and modelling of acoustics, see Fig. 3.

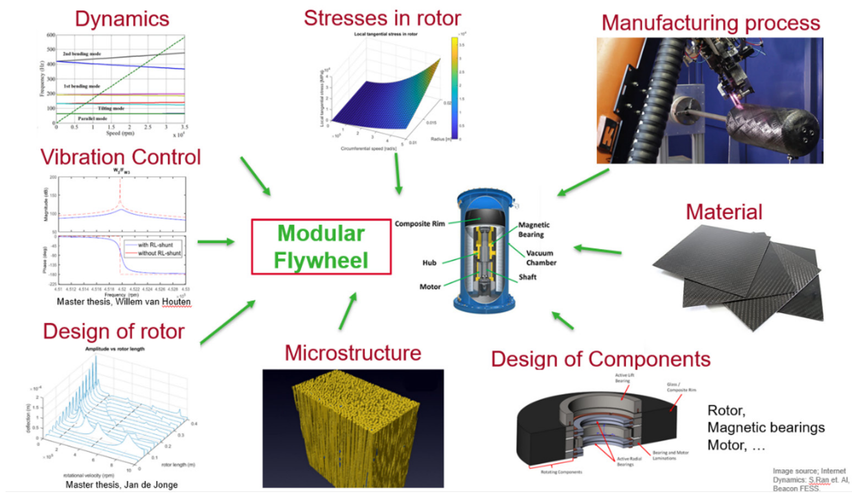


Fig. 1: An example of system to component modelling and design approach

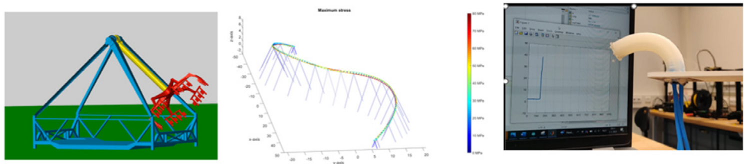


Fig. 2: An example of modelling and designing flexible/soft (multi)-body system (Jurjen Blaauw, Maarten Maris and Minke Berghuis)

To incorporate experimental data, design parameter variation, the experts knowledge and material variation into large computational physics-based models, we develop the so-called model reduction or sub-structuring techniques, which are assembled into the so-called surrogate/meta models, i.e. the real-time simulation models. These models are based on the machine/deep learning approaches that embed physics into their architecture. In a similar manner, we investigate the model/parameter/state identification given experimental data by use of machine learning or classical approaches. The identified models are used for control purposes developed in artificial intelligence setting. In our group we have two labs: one for dynamics analysis and active noise control and the other is currently being made for additive manufacturing of concrete by collaborative robotics. The applications areas of our research are wide and include industrial robotics, manufacturing, design optimization/automation, and biomechanics.

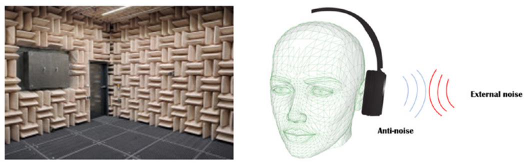


Fig. 3: Active noise cancellation (left: anechoic chamber room, right: ear noise cancelling)

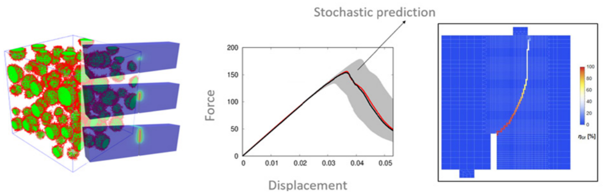


Fig. 4: Modelling of stochastic fracture propagation

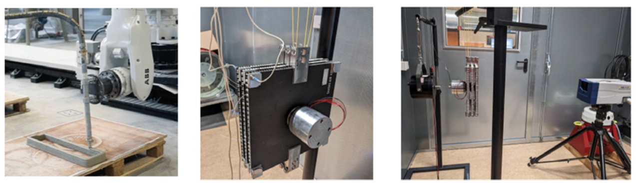


Fig. 5: Left: Concrete lab (in preparation), right: dynamics lab

CDSM

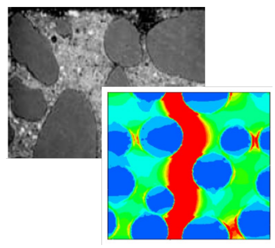
COMPUTATIONAL DESIGN OF STRUCTURAL MATERIALS

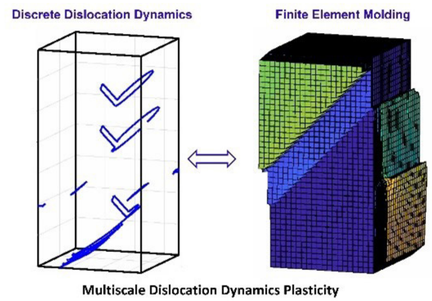
Our aim is to understand, describe, control and optimise the behaviour of materials and structures by understanding, describing, controlling and optimising their micro-structures. Our ultimate goal is to provide the industry and fellow academic community with suggestions on how to improve sustainability and offer customisable recommendations; numerically predict the behaviour of novel materials, decrease the time and number of costly experiments used for analysis and ultimately decrease the price of components and structures.

We see our general research goal in improving existing materials' properties, such as strength, ductility, and thermal properties; reducing the cost, weight and waste; increasing sustainability and architectural freedom; and potentially creating new materials with desired and tuneable properties.

Our main research themes are mechanics of materials and computational analysis. We aim at describing, analysing and optimising material's behaviour by means of numerical modelling at multiple scales (via molecular dynamics, dislocation dynamics, FE, data-driven and fuzzy set-based approaches), statistical and stochastic characterisation.

We work with a range of applications from man-made materials, such as elastomer composite materials filled with nanofiller, recycled fibre-reinforced polymer composites, metals, and 3D-printed materials; to bio-materials, such as bones and teeth. We work on different scales of observation ranging from nano- to macro-, and consider how these scales cross-fertilise each other via multi-scale modelling strategies.





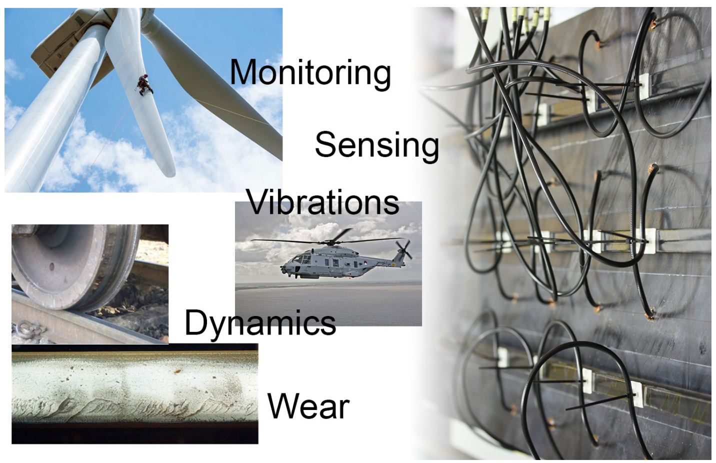
DYNAMICS BASED MAINTENANCE

DBM

Dynamics Based Maintenance focuses on the improvement of lifetime performance of structures and systems. On the one hand, we do this by analysing and modelling how materials degrade, what the underlying physics are of the failure behaviour, while on the other hand, we use dynamics to assess the current state which we compare to a reference to verify if the structural integrity of the structure is not compromised.

Knowledge of the state of the structural integrity and of the remaining useful life is relevant to use systems in an optimal way. We can find a better balance between the risk of (catastrophic) failure and conservative maintenance, which results in unnecessary scrap of materials and a reduced availability of the system.

Questions that arise are: can we operate the wind turbine for another couple of months? Can the power on the electrical power grid be kept at this high level for much longer? How long can we operate this train, or when is maintenance on the track? Did the impact on the aircraft result in damage that needs to be repaired before the next flight? In more detail: how to model the degradation process? How to measure it? Which dynamic method can be used to identify the presence of damage?



THEMES

ELASTOMER TECHNOLOGY AND ENGINEERING

ETE

The key topic of the chair of Elastomer Technology and Engineering (ETE) at the University of Twente is material development. Within this area, the main areas are:

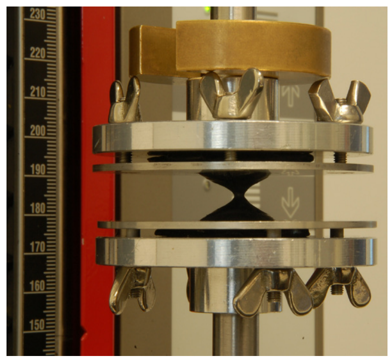
- filler technology;
- natural rubber;
- fibre reinforcing;
- recycling.

The common ground of all projects within ETE is sustainability.

The mission of the Elastomer Technology and Engineering group (ETE) is to establish itself as a ‘chain of knowledge ’ in the field of elastomer technology, with a clear emphasis on research subjects at the forefront of new developments. The group serves as an academic training ground for students and scientists in the rubber world at large. The group aims at playing a key role in the academic and industrial world of elastomer technology and to be an obvious participant in new developments. The elastomer world faces a series of important challenges for the future, of which the most important ones are:

- The global need for energy savings, particularly related to the energy consumption of tyres by their rolling resistance: about half of the net energy from automotive fuel consumption;
- The need to find feasible recycling routes for elastomer articles, and tyres in particular;
- Environmental and safety issues related to the use of various rubber ingredients in production as well as in use.

The ETE group aims to position itself explicitly in these fields.



FUNCTIONAL SURFACE ENGINEERING & DESIGN

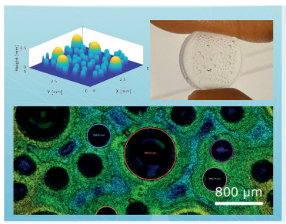
FUSED

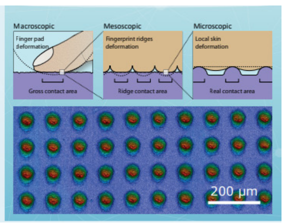
From parametrisation of application needs to predictive tools for production processes. Product surfaces have various mechanical, chemical, optical and biological properties. Application needs are correlated to surface parameters through modelling, production and testing.

The outcome is a predictive tool, which connects possible surface designs and resulting performance. The tool is experimentally validated and aimed for industrial integration.

Examples of research areas are:

- **Taste mechanics**: Modelling and physical replication of mechanisms responsible for astringency feel provide insights on how to improve food products.
- **Cobot arm gripper**: Coupling polymeric materials with biomimetic designs has enabled more accurate placement of small, sensitive parts during manufacturing.
- **Touch perception**: Advanced contact models and parametric surface design tailor polymer products to influence user interaction and product perception





LP

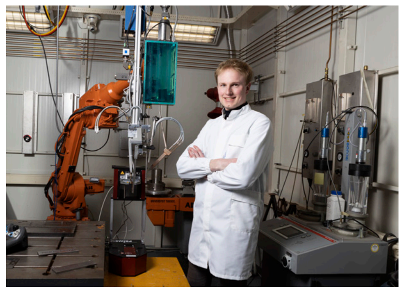
LASER PROCESSING

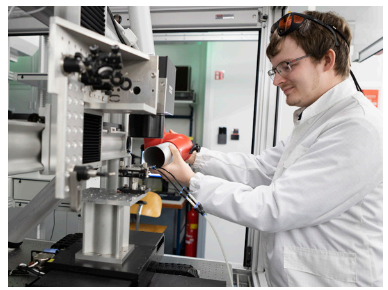
In the Chair of Laser Processing fundamental physical phenomena occurring during laser-material interaction are studied. Laser-material processing allows to realize applications, which cannot, or are very hard, to realize using conventional processing techniques.

A focus area of the group is material processing using ultra-short pulsed laser sources, with pulse durations in the femto- to picosecond regime. Unlike "long" pulsed and continuous laser processing, where repeatability is hindered by the randomness of the melting process, ultra-short pulsed processing results in increased accuracy and repeatability. Hence, ultra-short pulsed processing allows micro- and nano-machining on the nano- to micrometer scale.

Another research area is the use of continuous high power—i.e. 10kW-laser sources for additive processes including laser cladding—i.e. a coating technique— and laser-based Directed Energy Deposition (DED), an additive manufacturing (3D printing) technique. In this approach, a focused laser beam creates a melt pool on the surface of a substrate, into which material is injected, usually in the form of (metal) powders. This allows manufacturing of large metallic parts with controllable functional material properties.

Based on the knowledge gained, means and methods for monitoring/sensing and control of laser-material processing are developed, to ensure robust and reliable laser-based manufacturing. Research results (projects and publications) provide key enabling technologies for numerous new applications and innovative laser-based manufacturing.





NONLINEAR SOLID MECHANICS

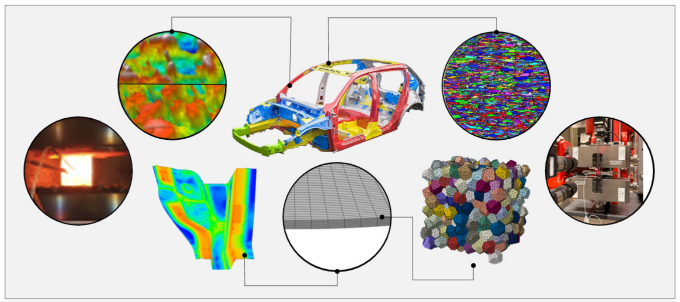
NSM

Our team is dedicated to understanding the complex behavior of material systems and their interfaces under extreme conditions such as those encountered in manufacturing processes, and to leverage this knowledge to develop innovative solutions in a variety of engineering fields. To advance our goals and address the challenges facing the industry today, we incorporate cutting-edge experimental and numerical methods derived from materials science, engineering, and computer science.

Our research interests are vast and varied, encompassing a diverse range of topics some of which include additive manufacturing, battery can production, multi-scale material and friction modeling, physics-informed machine learning, digital twins, and computational methods for predicting the behaviour of materials and structures. We also focus on process simulation for design, optimization, and monitoring of manufacturing systems.

Working closely with industry leaders, we are committed to advancing the field of materials science and engineering to drive progress toward enhanced performance, efficiency, and environmental responsibility in engineering systems. We invite you to join us on this fascinating journey as we strive to revolutionize the field and make a positive impact on the world.

To learn more about our current research projects and other opportunities, we invite you to visit our website at https://www.utwente.nl/en/et/ms3/research-chairs/nsm/ or simply scan the QR code for quick access.



experiment - modeling - simulation

PRODUCTION TECHNOLOGY

PT

he properties of polymer-based composites and lightweight alloys strongly depends on the chosen manufacturing process. Prediction of the performance of a part or structure is, therefore, only possible in case processing history is considered. Optimization of manufacturing processes and part performance require a combination of experimental work and (numerical) modeling. The experimental program aims to identify the governing mechanisms, establish relevant material property data for the modeling steps, and provide data to validate the proposed predictive models. The developed models aim to enable 'first-time-right' manufacturing and predict the long-term mechanical performance of the manufactured part. An integral approach is needed, considering the interrelations between the design, the manufacturing process, and the material properties.

The current research activities include (among other topics) manufacturing and performance of high-performance polymers and polymer composites for aerospace applications, solid-state additive manufacturing of aluminum, and the development of new alloys that can be used for 3D printing.

HTSM has close cooperation with the ThermoPlastic composites Research Center (TPRC), an open research center founded by Boeing, GKN/Fokker, Toray Advanced Composites, and the University of Twente.

PRECISION ENGINEERING

PE

Societal trends introduce new challenges for the development of high-tech systems and precision robotics, for example, platforms with increased speed and platforms for more capable and affordable micro-electronics, versatile grippers for robotized agriculture to cope with worker-shortages, or MRI-compatible precision needle placement systems for image-based surgery.

The research at the PE lab consists of design principles and advanced motion control, which are both strongly driven by efficient non-linear computer modelling. By developing new and advanced modeling methods like flexible multibody modeling, complex system designs can be thoroughly analyzed, understood, designed and optimized. The main goal of the control activities is to develop improved motion control using an adaptive model-based approach.

A master assignment typically consists of one, two or three of the following disciplines design principles, motion control and modelling.

The group has strong ties with the HTSM industry with 3 part-time researchers of Demcon and VDL ETG in the group, and the group is one of the 4 core UT groups of the new Robotics Centre Twente.

Recently we developed several hexapods, a needle placement system, and various grippers. A typical master assignment would involve the design and modelling of these, or the development of an adaptive feed forward control algorithm to maximize the performance of these.

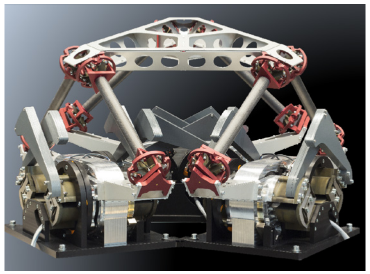


Fig. 1: The precision large range of motion hexapod with adaptive feed-forward control.

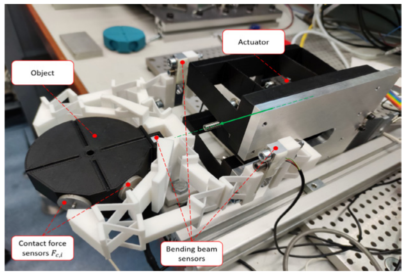


Fig. 2: A flexure-based gripper with a minimum number of sensors

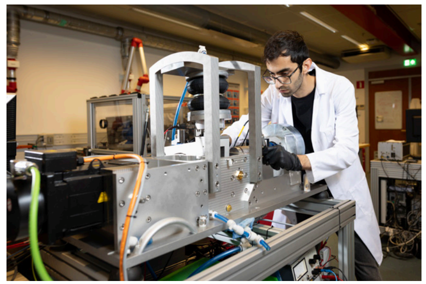
SURFACE TECHNOLOGY AND TRIBOLOGY

STT

The research and education of the Surface Technology and Tribology group focuses on surfaces and interfaces in an engineering context, as well as degradation mechanisms taking place at these surfaces and interfaces.

Mechanical Interfaces can be divided into 3 types: 1) moving interfaces, 2) interfaces that are about to move and 3) stationary interfaces. In moving interfaces tribological phenomena play an important role, like friction, wear and lubrication and sealing. Examples of interfaces where the transition from a stationary situation to a moving situation is important are earthquakes, positioning mechanisms, but also several types of joints. In stationary interfaces, reliable adhesion and adhesive bonding are very relevant. The group collaborates closely with industrial and scientific partners on research, which can be categorized into these three themes.

Knowledge in the area of surfaces and interfaces as well as degradation and lifetime is crucial in sustainability and circularity. Tribological contacts are estimated to consume around 23% of the total energy consumption worldwide, covering both frictional losses and remanufacturing of worn parts. So, a very significant amount of materials and energy can be saved by good control of these mechanical interfaces. Further, a solid scientific understanding of the cause behind maintenance, the occurrence of degradation, is a prerequisite for smart maintenance strategies. Examples of current research are the development of techniques to bond thermoplastic materials to metals, predicting the lifetime of backup rolls, predicting the lifetime and performance of lubricating greases, modelling degradation in aramid ropes as well as understanding frictional phenomena in gouges related to a deeper understanding of earthquakes.



TRIBOLOGY BASED MAINTENANCE

TBM

By far most rolling bearings are grease lubricated. A lubricating grease is often preferred over oil because it does not leak out of a bearing and provides very low friction and therefore low energy losses. The subjects that are addressed in Tribology-based Maintenance (TBM) are related to the development of models/theory to predict durability/reliability and frictional losses for grease-lubricated bearings (the keyword is sustainability).

Examples of projects that have been run so far are:

- Understand grease rheology
- Development of Elasto-Hydrodynamic Lubrication (EHL) film thickness models
- Development of oil separation models (assuming that grease is a porous medium)
- Thermo-mechanical degradation of grease due to high shear and temperature
- Remaining grease life

TBM is the host of the SKF University Technology Center of Grease Lubrication. Research is executed in close collaboration with SKF Research & Technology Development in Houten/Utrecht and various lubricating grease manufacturers. Traineeships and MSc projects can be done at SKF in Houten (housing is available). TBM works close together with Engineering Fluids Dynamics (ET) and the Physics of Complex Fluids group (TNW).

Are you interested in reducing energy consumption and waste, enjoy model development and/or understanding the physics (and possibly chemistry) of this fascinating material, in collaboration with industry: contact Prof Piet Lugt or Dr Jude Osara.

SKF UTC UNIVERSITY OF TWENTE.

Courtesy of SKF

SOCIETAL RELEVANCE

Many engineering jobs require a thorough understanding of the mechanical engineering fundamentals. Therefore HTSM offers advanced courses in the direction of mechanical engineering core disciplines. These courses explain you the state of the art in:

- Solid Mechanics
- Fluid Mechanics & Thermodynamics
- Dynamics
- Precision Engineering & Control
- Materials Science
- Design & Production

You will become an expert in developing mathematical models and algorithms to describe the properties and behaviour of single and interacting materials and systems to put them to maximum industrial use. From researching the large deformation behaviour of high-strength steel to the properties of new thermoplastic materials and from analysing and controlling the dynamic behaviour of systems to designing a test rig for the validation of new products: your expertise will be highly relevant within R&D departments of any industrial company.

COURSES

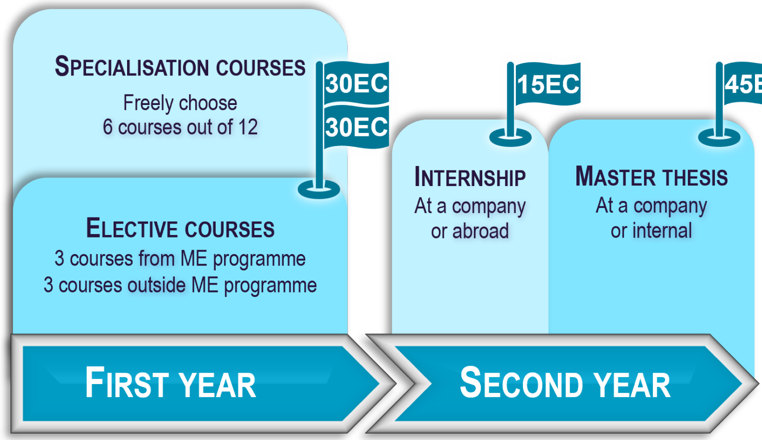
Course overview

Master students are to choose 6 (out of 12) core specialisation courses. On top of that students are free to choose Elective courses. The best course package is a personal package, which can be discussed with the department portfolio manager education dr.ir. R. Loendersloot (see last page for contact details).

CORE SPECIALISATION COURSES (CHOOSE 6 OUT OF 12)

- Advanced Topics in Finite Element Methods
- Control System Design for Robotics
- Design Principles for Precision Mechanisms 2
- Design, Production and Materials
- Experimental Methods
- Flexible Multibody Dynamics
- Fluid Mechanics II
- Frontiers to High-Tech Systems and Materials
- Linear Solid Mechanics
- Nonlinear Solid Mechanics
- Plastic & Elastomer Engineering
- Solids & Surfaces

The 2nd year of the MSc-ME includes an internship and a master assignment in one of the research chairs within Engineering Technology.



WHY CHOOSE HTSM?

You can complete a Master's degree in Mechanical Engineering at many universities here in the Netherlands and around the world. The ME programme at UT and this specific specialisation are unique for the following reasons:

The research groups involved in this specialisation have a strong background in (non-linear) mechanics (forming and dynamics), manufacturing processes (control), composites and interfaces, and all have formed strong collaborations with industrial partners in these fields. This creates an excellent platform for boosting the education of mechanical engineers who will be responsible for the development of future products and processes.

There is a strong collaboration with the Thermoplastic Composites Research Centre, a globally renowned leader in the advancement of composites technology for large-scale industrial application. Many students enrolled in the HTSM specialisation work with TPRC and its partners, which include firms such as Boeing, GKN-Fokker and Toray Advanced Composites.

Over the past decades, rich research portfolios have been established in collaboration with other large industrial partners such as Tata Steel, Shell, Apollo Vredestein, ASML and offshore companies (e.g. Allseas), as well as with smaller companies, such as DAF trucks, Demcon and many other small to medium-sized Enterprises (SMEs). More research-oriented, the research groups within the faculty work together with divisions of the NLR, TNO, the Fraunhofer Institute and a number of international universities.

EDUCATION AND RESEARCH

Both education and research at the High-Tech Systems & Materials specialisation are strongly related. That means that the latest research results are included in the Master courses and in the Master assignments.

Staff of HTSM can assist in finding traineeships within their international network.

Master students are involved in activities related to the wide research themes of the specialisation. The work is closely linked to national and international innovative Industries, as well as to other research institutes. Both internal and external Master-assignments are often part of ongoing research projects or collaborative research programs. Most assignments are a well-balanced mix between analysis, (theoretical) modeling and experimental work. During the project students are coached by the permanent and/or temporary staff of the specialisation.

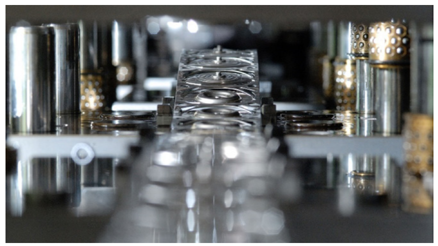
MSC GRADUATION ASSIGNMENTS

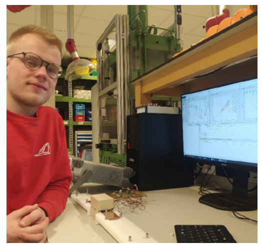
Eddy current sensors for material behaviour prediction WIARD VAN DER WEIJDEN

In recent years there has been a strong push to use increasingly more recycled metals. Using recycled metals can often strongly reduce the production costs as well the environmental footprint. The problem that must be overcome when using recycled materials is higher impurity levels and thus less predictable material behavior. This decrease in predictability can cause major problems for many industries because the process parameters should ideally be calibrated for each incoming batch of material.

A potential solution for this problem is given in the form of the eddy-current sensor developed by Philips Drachten. An Eddy-Current sensor allows monitoring the magnetic properties which tells us something about the microstructure and mechanical properties. To properly understand the sensor signal two questions must be answered.

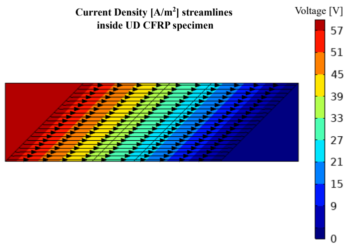
(1) How is the measurement signal related to the magnetic properties of the material? A FEM model is created is in which the sensor response is simulated for sheets with varying thicknesses, widths and magnetic properties which shows the relation between sensor signal and magnetic permeability.
(2) How are the magnetic properties related to the mechanical properties? Mechanical and magnetic homogenization are used to show that the magnetic permeability is related to the hardening and yield behavior.





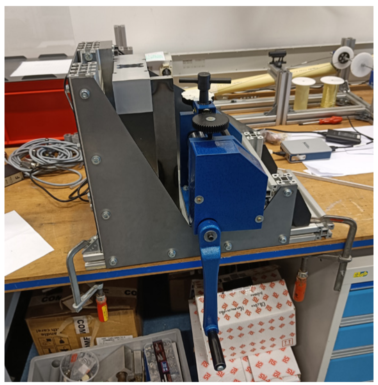
MEASURING THE ELCECTRIC CONDUCTIVITY OF UD CFRP LAMINATES AZIZ COULIBALY

A numerical model capable of predicting the resistive heating inside of a CFRP laminate during induction heating would provide significant value for a rapid manufacturing process such as induction welding. One of the challenges is predicting the electrical behaviour of the complex carbon fibre network inside the polymer matrix. My research is aimed at outlining a comprehensive test methodology to accurately measure the electrical conductivity of UD CFRP laminates with off-axis fibre orientations. This is done in collaboration with TPRC and the Production Technology research group.



CONTINUOUS MATERIAL SUPPLY FOR EXTRUSION-BASED ALUMINUM PRINTING JOB JANSEN

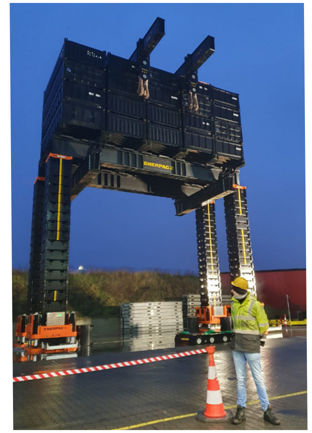
Within the Production Technology group research on additive manufacturing for aluminum using a friction screw extrusion is done. The aim of this process is to plastically deform the material without melting it when extruding, resulting in superior material properties of the printed objects. However, the current method of supplying material into the extrusion screw involves the use of a hydraulic press, making continuous printing challenging. Moreover, this method causes irregular temperature changes in the screw extrusion head. To overcome these challenges, my research is focused on developing a suitable material feeding mechanism that can provide a continuous supply of material at the required forces.



OVA ON A SYNCHRONOUS PUSH-UP SYSTEM

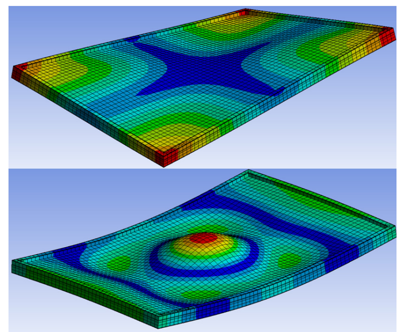
TIM BIJSTERBOSCH

Enerpac heavy lifting technology (HLT) in Hengelo is a company that is specialised in the design and production of heavy lifting equipment. One of these systems is a multipoint synchronous push-up system, capable of lifting 250 tons on each unit. The goal of my graduation assignment was to model transient forces in the system causing harmonic excitations during retraction using operational vibration analysis (OVA). Part of the assignment involved logging data from the full scale system, see figure. The research was performed under supervision of the 'Dynamics Based Maintenance' (DBM) research group at the University of Twente.



MODELLING FLUID-STRUCTURE INTERACTION IN FLOATING PV FLOATERS JOEP VAN MANEN

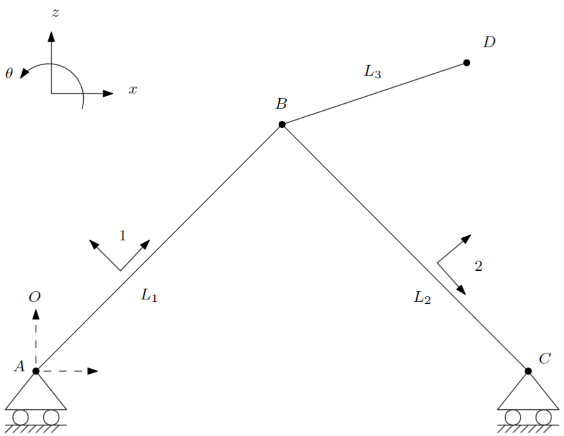
I carried out my Master thesis at Oceans of Energy, a scale-up company that develops offshore floating solar energy farms. For developing computationally efficient dynamic models of the floater structures, their eigenfrequencies and mode shapes need to be known. These parameters can be found through experimental or numerical modal analysis, however the interaction with water introduces extra inertia and stiffness to the system. My project is focused on modelling the fluid-structure interaction to extract modal parameters in floating conditions. To validate the method of modelling fluid-structure interaction, I designed, built, and tested a scale-model floater to test its behaviour in floating conditions and compare it with its free-vibration behaviour. In addition, I validated and improved the existing Finite Element models of the real floaters through experimental modal analysis. Using a validated method for fluid-structure interaction modelling combined with validated FE-models of the floaters, a complete modal analysis of the floaters could be carried out.



CONTROL OF FLEXIBLE MULTIBODY SYSTEMS

SAMEER NIZAMUDEEN

Robotic manipulators are multibody systems that are designed to perform a wide variety of tasks ranging from sorting and packing to assembling of parts. Some of these tasks require the manipulators to move precisely along a given reference trajectory at high speeds. As a result of this high speed motion, the bodies of the manipulators tend to experience elastic deformation and vibrations. In other words, these manipulators exhibit flexible behaviour. In addition, the manipulators undergo large rotations of their bodies which leads to their motion becoming non-linear. In order to ensure the precision and accuracy of these manipulators, it is important to model and control this non-linear motion and flexible behaviour. Thus, the goal of my Master graduation assignment is to develop and implement a control strategy for the reference tracking of flexible multibody systems. To this end, I am doing my research at an engineering company called Demcon in collaboration with the Precision Engineering group of the University of Twente. The flexible multibody system used for this research is a high precision pick and place manipulator designed by Demcon for one of their clients. The control strategy implemented is an adapted form of Computed Torque Control to overcome the non-linear and flexible behaviour of the multibody system.



'Ideal physical model of flexible multibody system'

CAREER PROSPECTS

As a graduate of the Master's in Mechanical Engineering with a specialisation in High-Tech Systems & Materials, you can look forward to great job opportunities in high-end engineering contexts. You could pursue a career in research or industry or work at the interface between the two. You could opt to further develop yourself by following a PhD- or EngD programme. Or what about starting up your own business?

This specialisation will turn you into a highly sought-after engineer with expertise in the field of mechanics, control, materials and processes, both fundamental and applied. With this knowledge and skills, you will be invaluable to companies that focus on the development of cutting-edge technologies in all kinds of fields, from the manufacturing industry to the energy sector and from the metal industry to the automotive or aerospace sector.

Many graduates of this specialisation work in research & development departments of different types of high-tech industrial companies (e.g. ASML, VDL, Demcon, Airbus, Bosch, Damen Shipyards), but also at research institutes (e.g. TNO, NLR – Netherlands Aerospace Centre) or engineering/consultancy firms (e.g. Mecal, Reden). In your future job, you can deal with a wide variety of challenges and tasks, from conducting research and creating physics-based models in order to understand complex systems to developing new materials, technologies and systems for many different applications.

CAREER PROSPECTS

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For more information about the High-Tech Systems & Materials specialisation the following persons can be contacted. Students are encouraged to pop in for more information.

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