High-Tech Systems and Materials

Information MSc Specialization

dr.ir. Richard Loendersloot

University of Twente

04.04.2024.

PURPOSE OF TODAY

Providing you with a good idea of what the **H**igh **T**ech **S**ystems and **M**aterials specialization is about with regards to:

- Engineering topics
- Courses
- Graduation, Eng-D, PhD

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Important take-home message:

HTSM is a great specialization*

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- Engineering topics
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Important take-home message:

HTSM is a great specialization*

*A message brought to you by all other specialisations

PROGRAM

13:45-14:00: Welcome with coffee and cake

14:00-14:30: Introduction in the specialization (Richard Loendersloot)

14:30-15:00: Presentation Joachim van de Weg – alumnus working at REDEN

15:00-15:30: Refreshment break & demos/posters/etc.

15:30-15:45: Presentation MSc student Jochem den Os

15:45-16:00: Presentation PhD student Minke Berghuis

16:00-16:30: Education (Richard Loendersloot)

16:30-17:30: Drink, demos, posters, talks with lecturers and PhDs

General information about HTSM

Information MSc Specialization

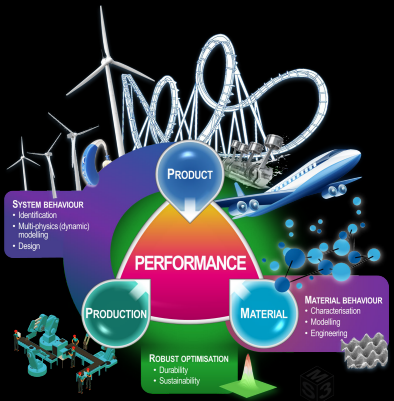
dr.ir. Richard Loendersloot

University of Twente

04.04.2024.

MASTER SPECIALIZATIONS

1. Aeronautics
2. Design & Manufacturing
3. Energy & Flow
4. **High-Tech Systems & Materials**
5. Maintenance Engineering & Operations
6. Personalized Health Technology
7. Smart & Sustainable Industry



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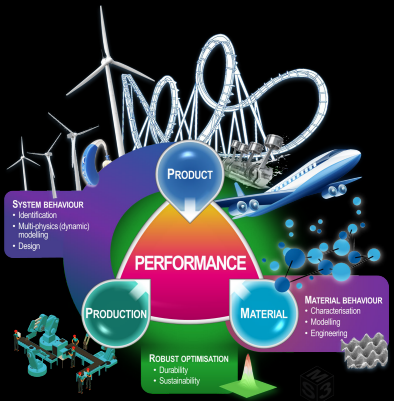

Popular statement

HTSM is not just alphabetically in the centre of the other specializations!

MASTER SPECIALIZATIONS

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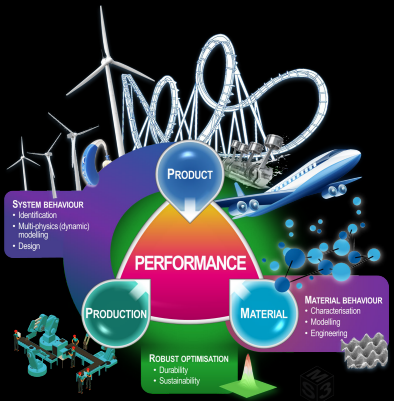


Realistic question

But what does **H**igh **T**ech **S**ystems and **M**aterials mean? What is special about it?

WHAT IS HTSM?

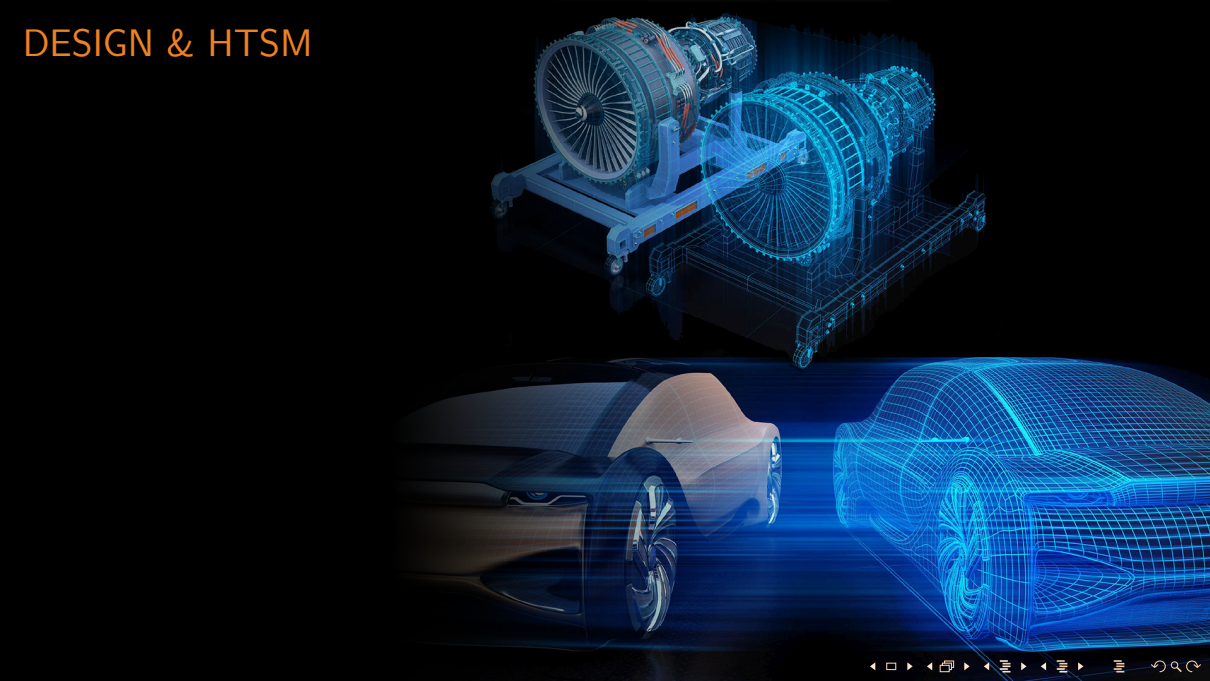
WooClap: participation is strictly anonymous!

WHAT IS HTSM?

WooClap Question – What does **H**igh **T**ech **S**ystems and **M**aterials stand for?

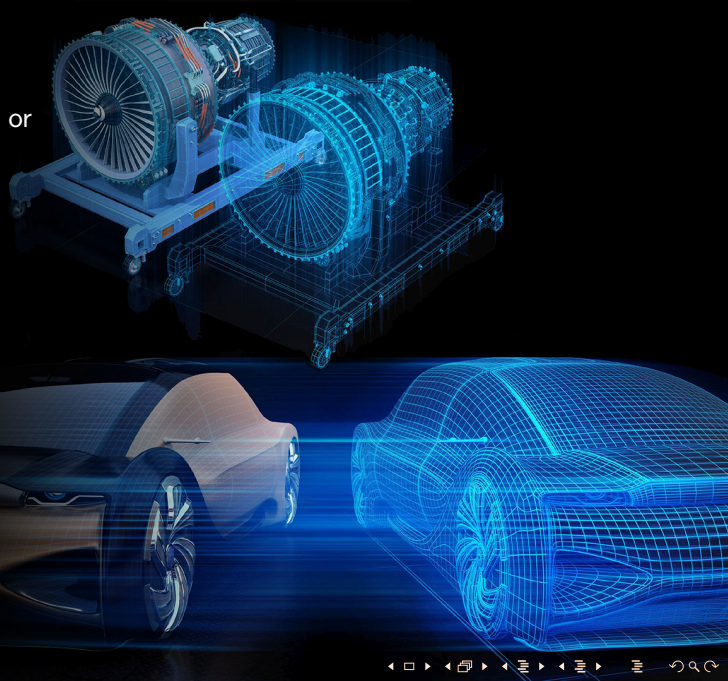
1. A research oriented specialisation
2. A design oriented specialisation
3. A specialisation with a very general character
4. I would not know, the title is too vague
5. A specialisation without a clear signature
6. A specialisation with a strong link to the challenges faced by industry
7. A specialisation link to the agenda of the Dutch Research Council (NWO)

DESIGN & HTSM



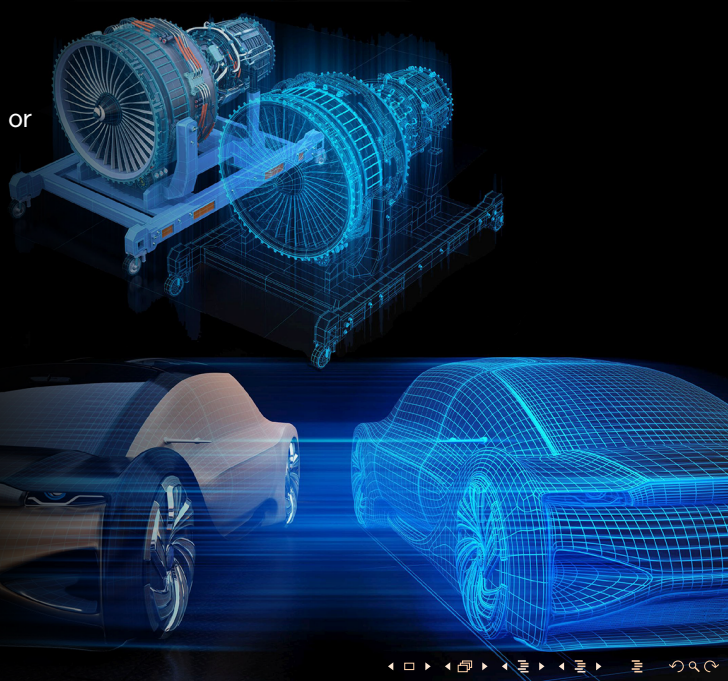
DESIGN & HTSM

- Realisation of complex products or systems



DESIGN & HTSM

- Realisation of complex products or systems
- Design with advanced materials



DESIGN & HTSM

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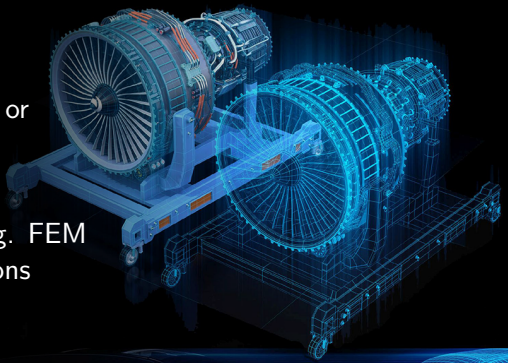
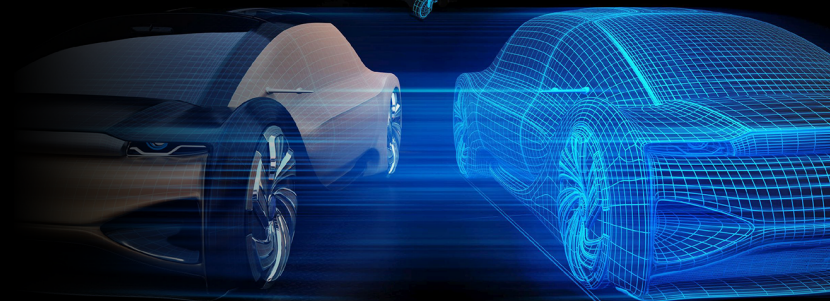
- Design with advanced materials
- Structural analysis of design: e.g. FEM analysis / cutting edge simulations software





DESIGN & HTSM

- Realisation of complex products or systems
- Design with advanced materials
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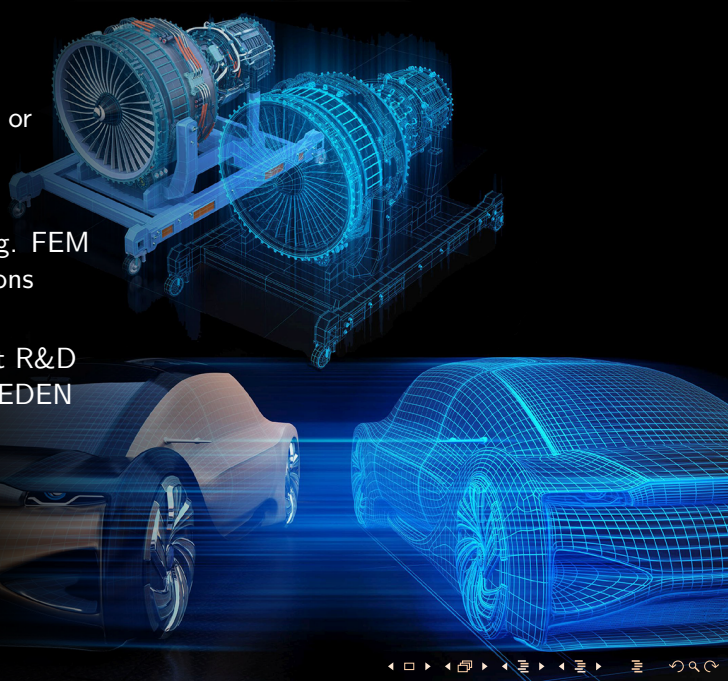
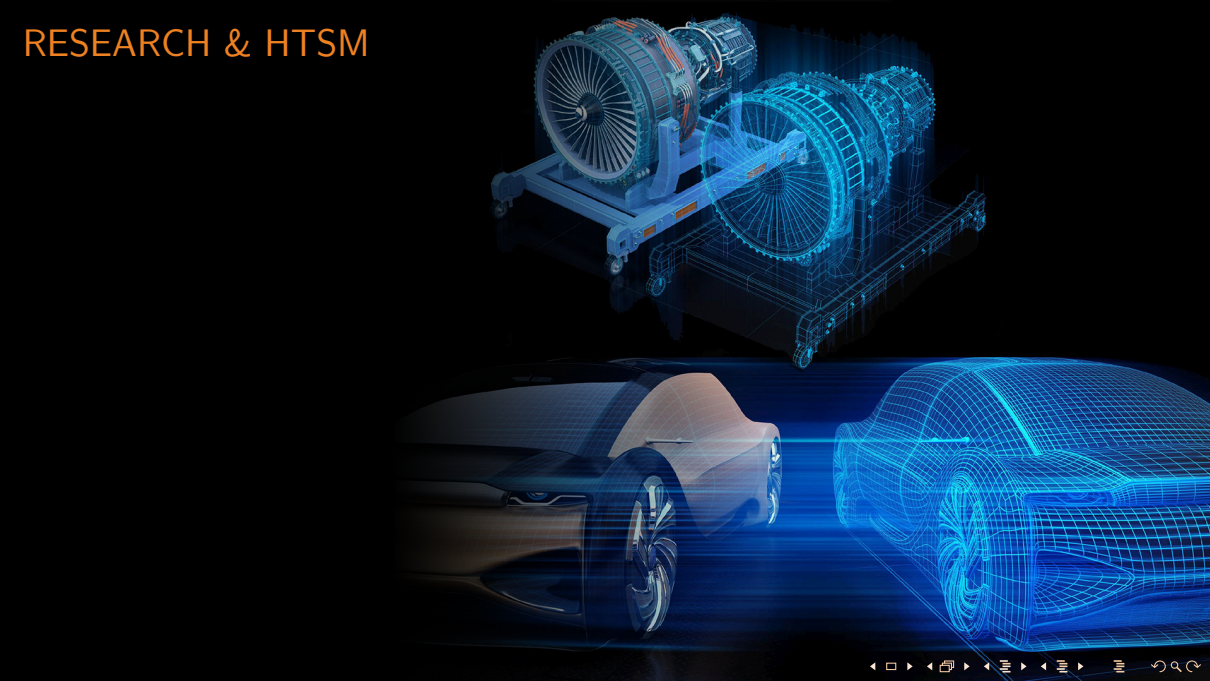
- Engineering practice: working at R&D department of company: e.g. REDEN

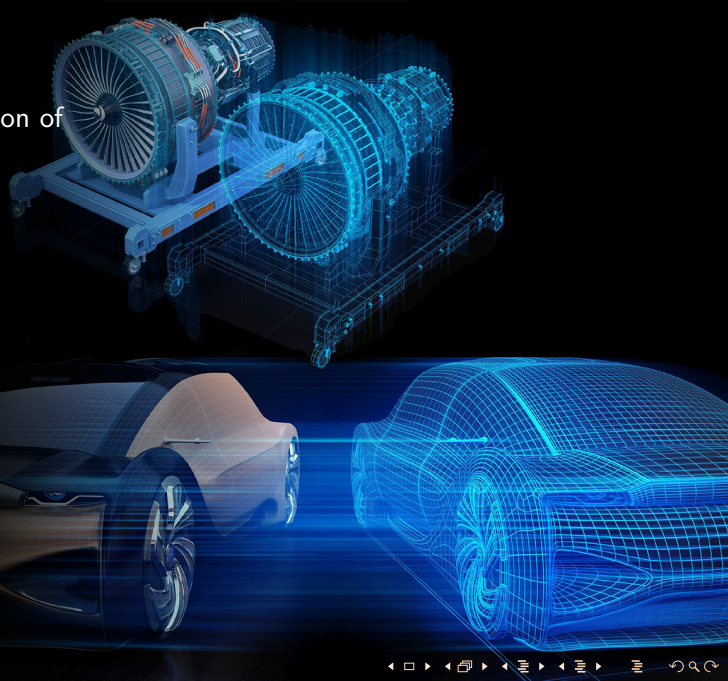


RESEARCH & HTSM



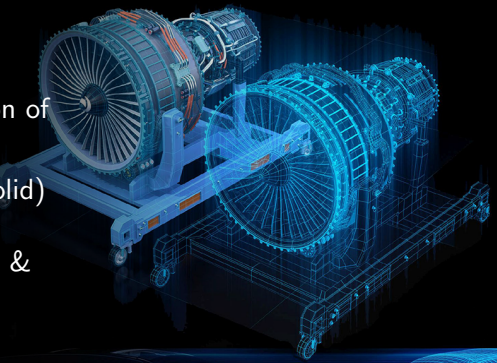
RESEARCH & HTSM

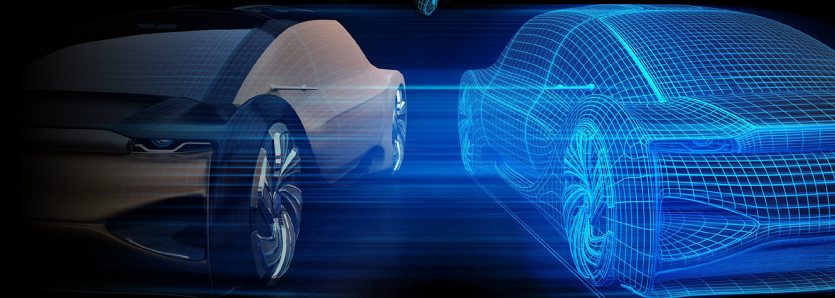
- Methodologies enabling realisation of designs of tomorrow



RESEARCH & HTSM

- Methodologies enabling realisation of designs of tomorrow
- Using fundamentals of (mostly solid) mechanics to improve modelling techniques, material performance & system performance





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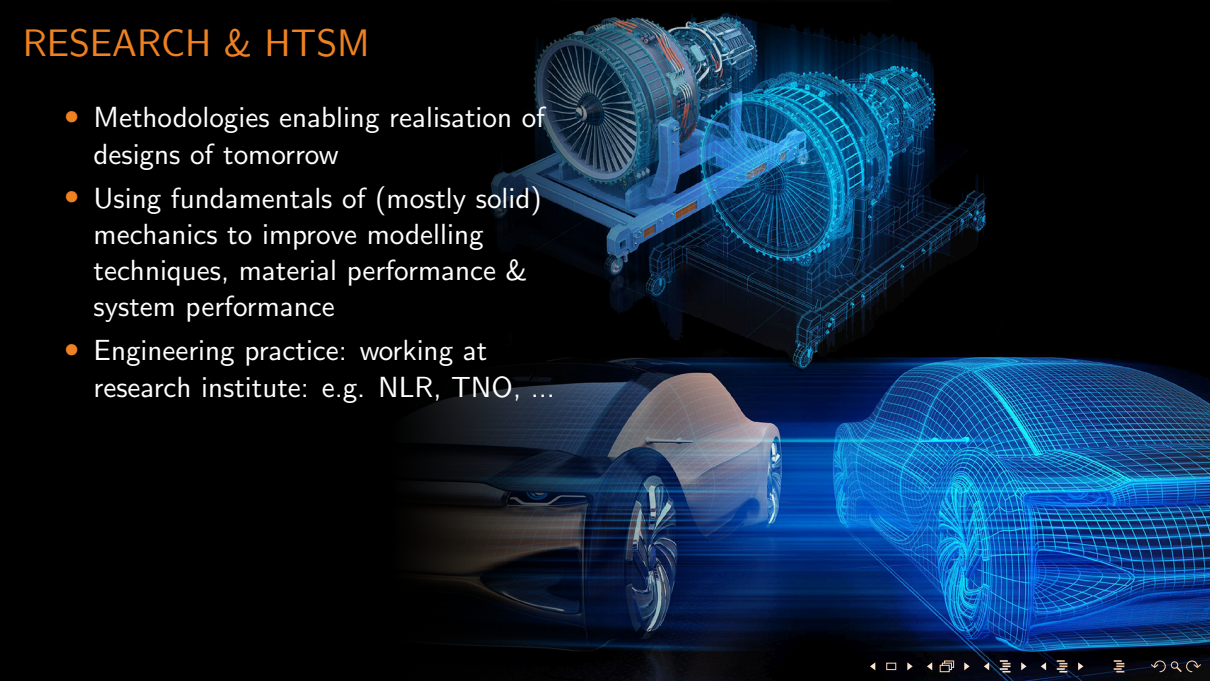

RESEARCH & HTSM

- Methodologies enabling realisation of designs of tomorrow
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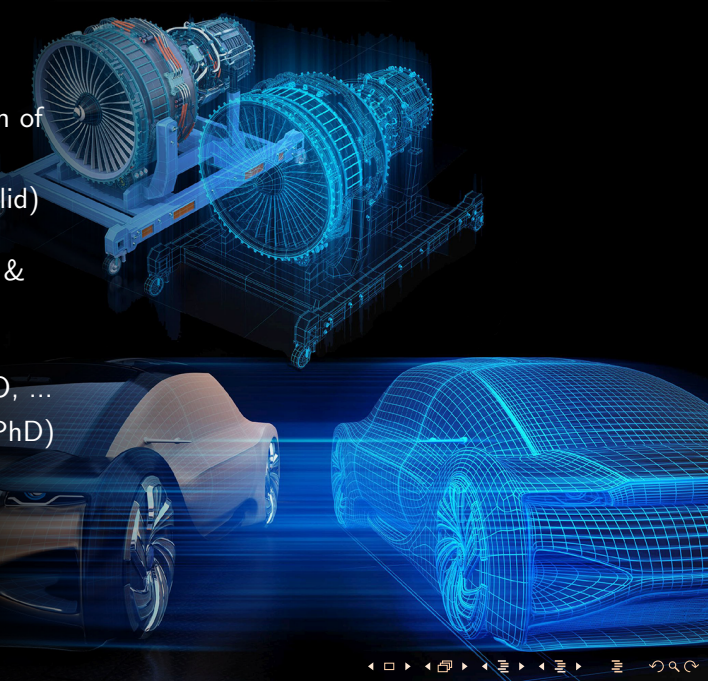
- Engineering practice: working at research institute: e.g. NLR, TNO, ...
- Pursue a career in academia as (PhD) researcher



NWO ROADMAP

The link with the Dutch Research Council

Roadmap High Tech Systems and Materials

Within the NWO theme High Tech Systems and Materials, scientists are working on new materials, new components and new functionalities for high-tech applications, ranging from healthcare, lighting, computer chips, complex equipment, robotics, communications, logistical systems, aircraft and satellites to energy generation and safety.

Research areas within this theme contributing towards the technology of the future include: embedded systems, photonics, advanced materials, ICT research, mechatronics, medical technology, microelectronics, nanotechnology, sensor technology, fluid dynamics and the technical sciences in the broadest sense.

Source: NWO High Tech Systems and Materials Research Program

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Not a useful definition or description....

MORE USEFUL


FrieslandCampina tio
TEIJIN
Norit
DEMCON
advanced mechatronics
Huisman
AkzoNobel
essent
VEKOMA
DSM
Movares
ASML
apollo
VREDESTEIN
ProRail
océ
TATA
NUON
SKF
PHILIPS
Grolsch
Johnson&Johnson
UNIVERSITEIT TWENTE.
VOLVO
SIEMENS
TNO innovation for life
St Radboud
Continental
TENCATE
materials that make a difference
Allseas
THALES
Unilever
ECN
BOSCH
TOYOTA
VIRO
NLR
SEAT
Van Oord
MECAL
THE UNIVERSITY OF NEW SOUTH WALES
SYDNEY·AUSTRALIA
STORK
CARGOTEC
urenco
Urenco Nederland B.V.
European Patent Office
Lloyd's Register
Sensata
Technologies

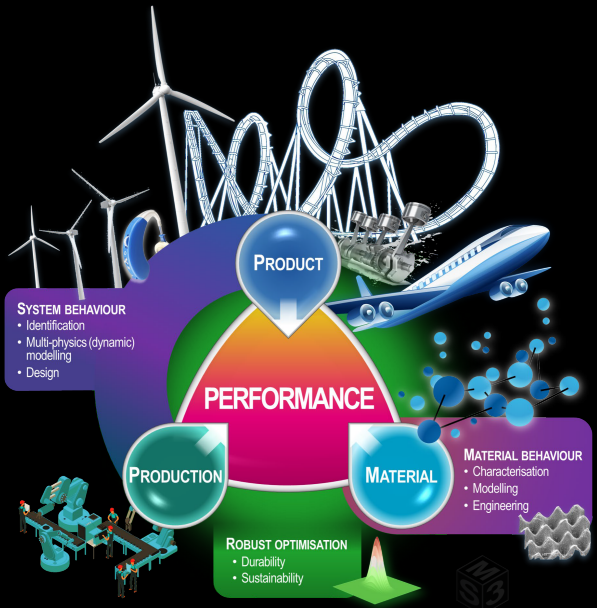
MORE USEFUL

An incomplete, yet fairly representative overview of companies

- working on the roadmap HTSM, strengthening the Dutch (High-Tech) industry, embedded in the European & global market
- where alumni of ME-HTSM work – and you could end up working after completing your studies!

WHAT HTSM IS

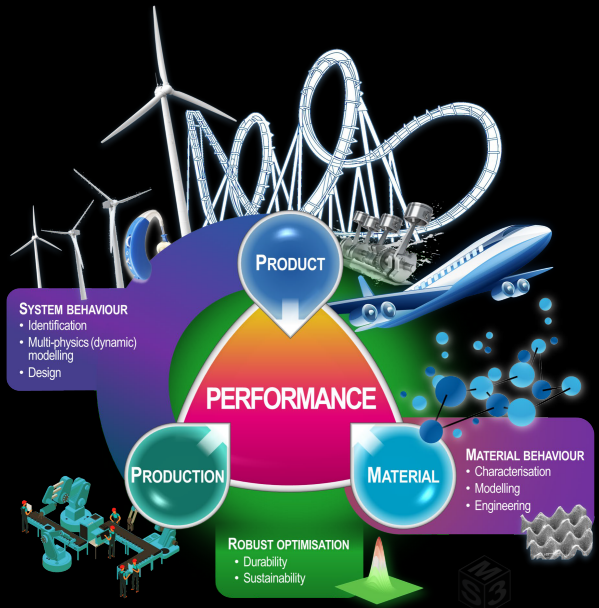
High **T**ech **S**ystems and **M**aterials



WHAT HTSM IS

High **T**ech **S**ystems and **M**aterials

- Is broad indeed



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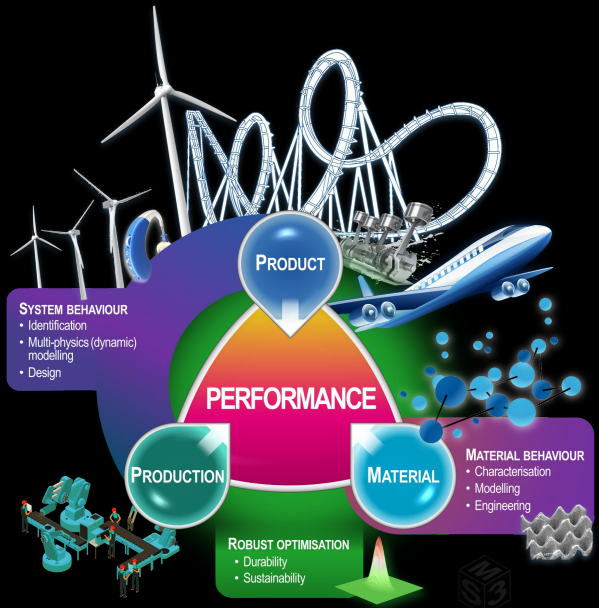
High **T**ech **S**ystems and **M**aterials

- Is broad indeed
- Is focussed on Performance



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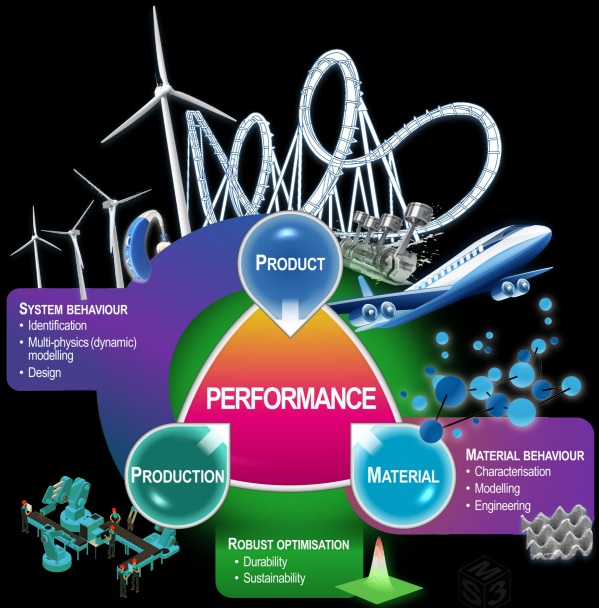
Performance related to:

- Product
- Production
- Material



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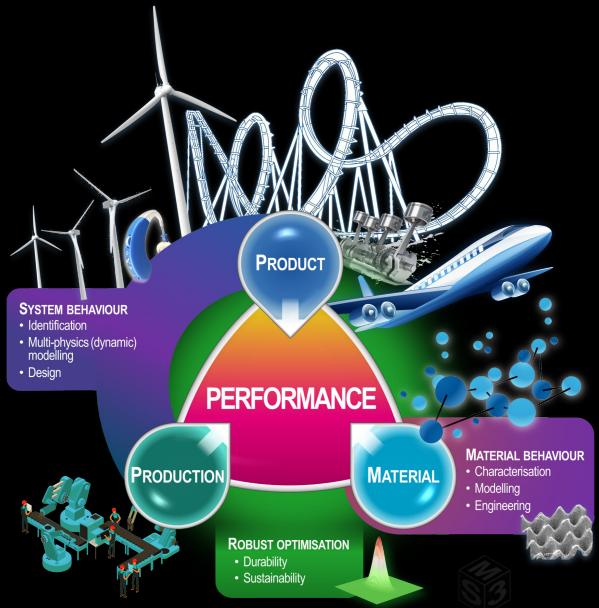
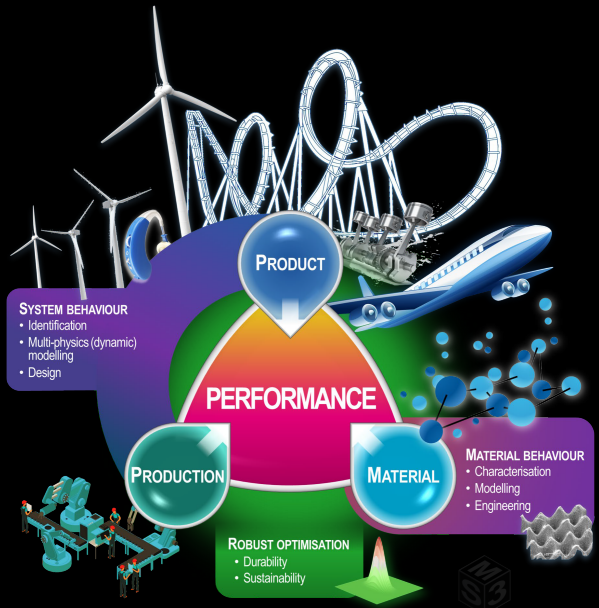
Note: the elements are strongly related to each other and mutually influence each other



WHAT HTSM IS

High **T**ech **S**ystems and **M**aterials will deepen and broaden your knowledge of

- Development
- Design
- Analysis
- Operational life



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- Development
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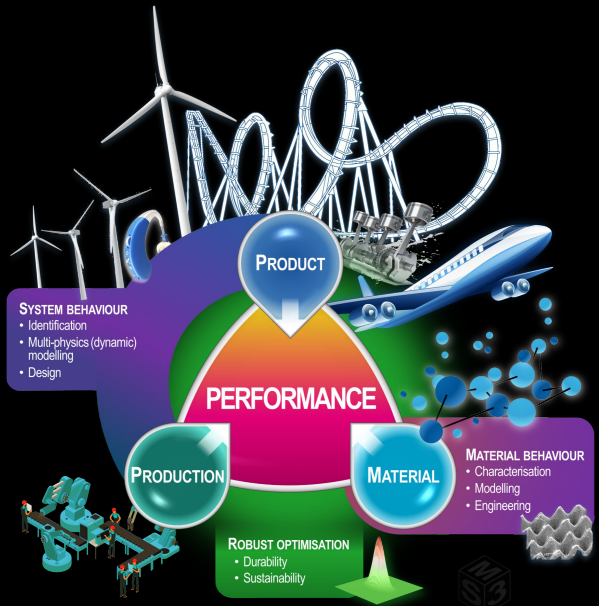
of

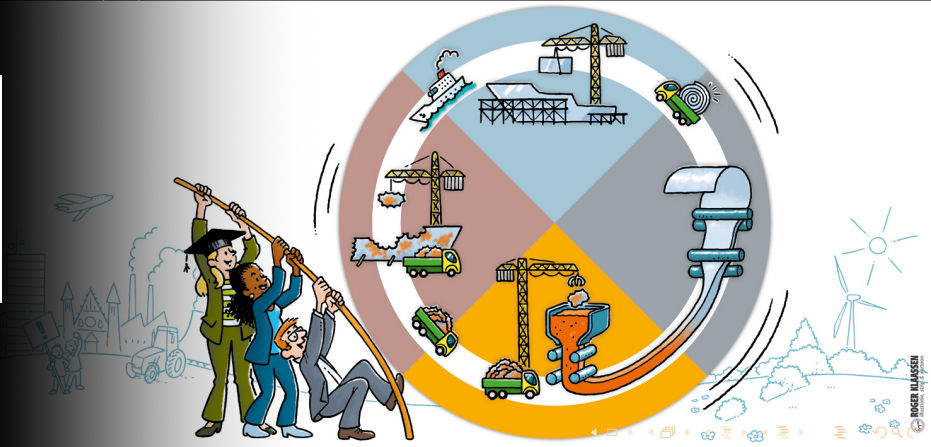
- Materials
- Structures
- Machinery
- Products
- Production processes



WHAT HTSM IS – EXAMPLES

The Dutch site of Tata Steel manufactures high performance steel, e.g. for the automotive industry. This is not possible without our research into nonlinear material behaviour during forming. The energy transition calls for more engineers.

https://groeienmetgroenstaal.nl/en/



WHAT HTSM IS – EXAMPLES

Oceans of Energy develops floating solar panels, that need to be able to sustain sea wave motion for at least 25 years. Our MSc students have a valuable contribution to the design of the structural elements, analysis of the dynamic behaviour and fatigue behaviour.

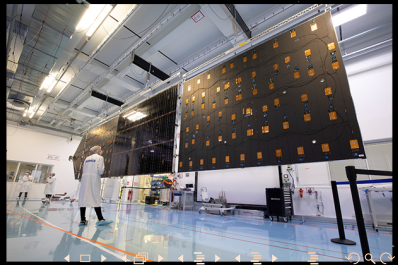
https://oceansofenergy.blue/projects/ – NORTH SEA 1 – surviving almost two years on the North Sea!

WHAT HTSM IS – EXAMPLES

Flexible Multi-Body Dynamics are of vital importance for the design and analysis of moving parts in the semiconductor industry (e.g. ASML), but also in space applications (Airbus Space – solar panel deployment).

By ESA, CC BY-SA IGO 3.0, CC BY-SA 3.0 igo,

https://commons.wikimedia.org/w/index.php?curid=130763022



WHAT HTSM IS – EXAMPLES

Design and manufacturing of composite materials is of crucial importance for companies and institutes like Fokker, Airborne, KvE, NLR and in (here) centered at the ThermoPlastic Research Center TPRC.

WHAT HTSM IS – EXAMPLES

The tires Apollo produces would not be performing as good as they do, in terms of grip, noise, endurance and recyclability without the our research.

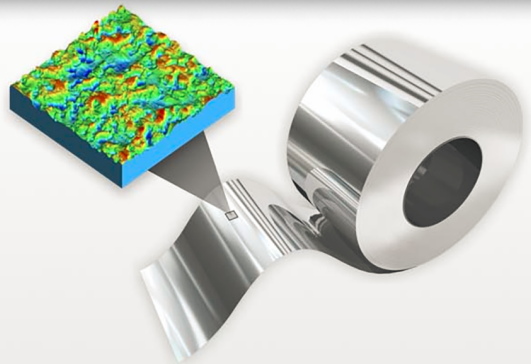
Cover PhD Thesis Carmela Mangone "Piezoelectric energy harvesters for tyres – bridging the research gap between materials and application"

WHAT HTSM IS – EXAMPLES

The spin-off company Triboform enables prediction of friction during deep-drawing, while the spin-off company Aniform enables the modelling of complex forming processes of composite materials. Both use the knowledge developed in our research groups and supported by MSc-assignments.

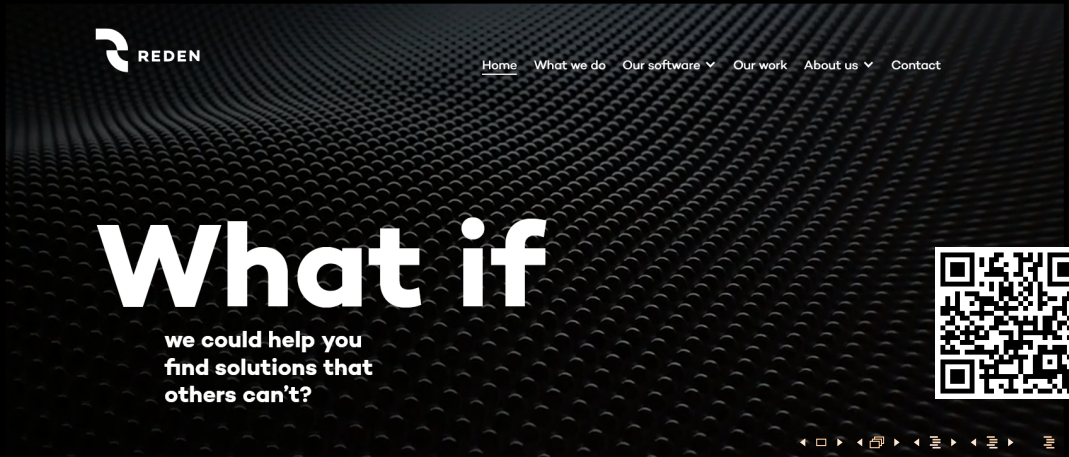
TriboForm

Simulate Friction and Lubrication Conditions



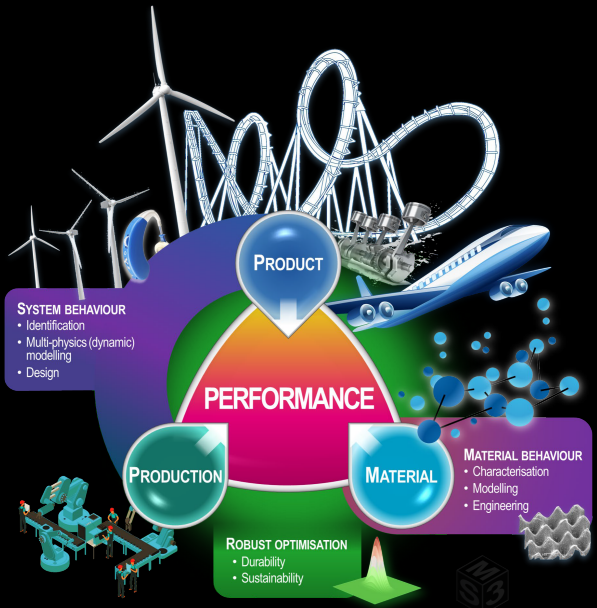
WHAT HTSM IS – EXAMPLES

Joachim van de Weg will tell what REDEN does (and how many MSc-ME alumni work for this company).



WHAT HTSM IS

Difference other specialisations



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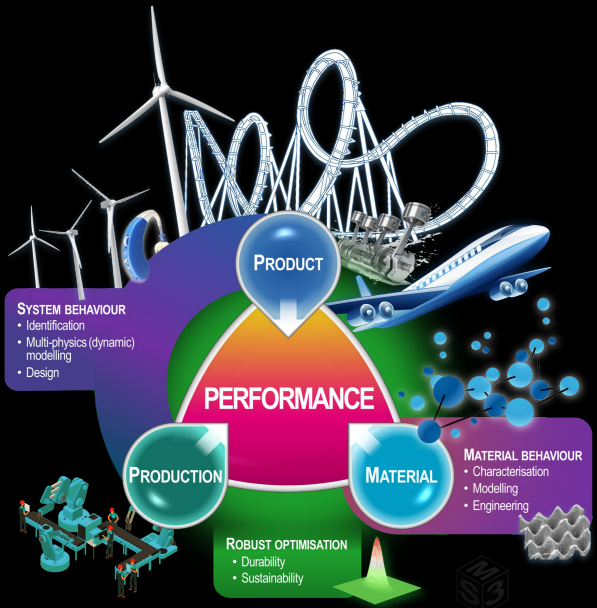
Difference other specialisations

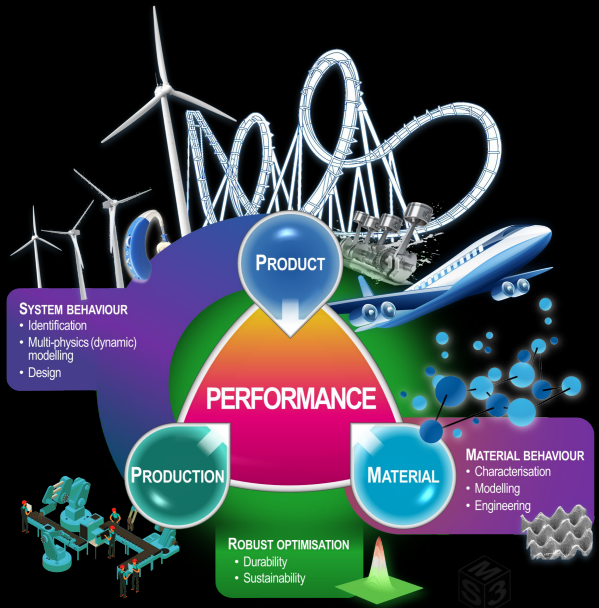
- focus on the behaviour of, and the interaction between, components (materials) and processes



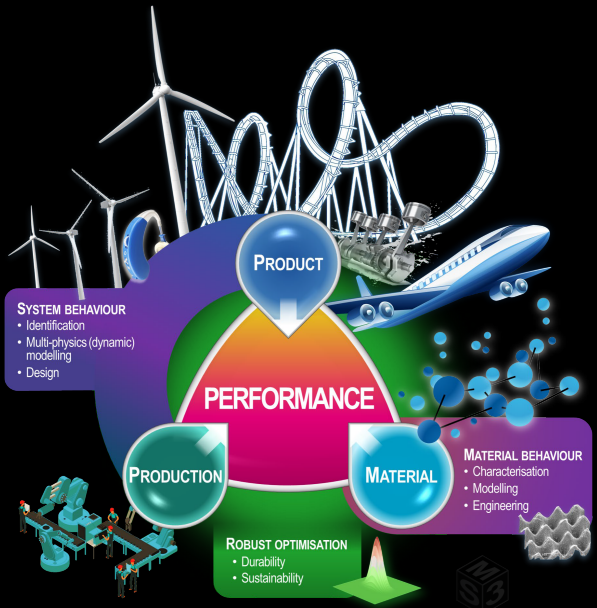
WHAT HTSM IS

Difference other specialisations

- focus on the behaviour of, and the interaction between, components (materials) and processes
- focus on, but not limited to, solid materials



FOCUS & THEMES



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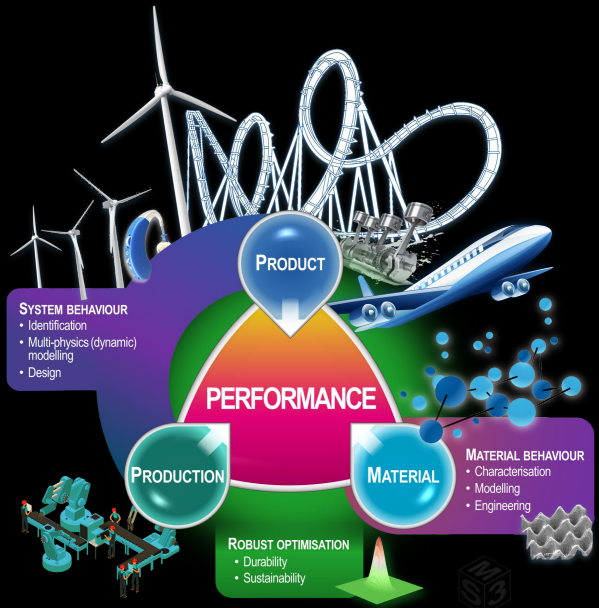

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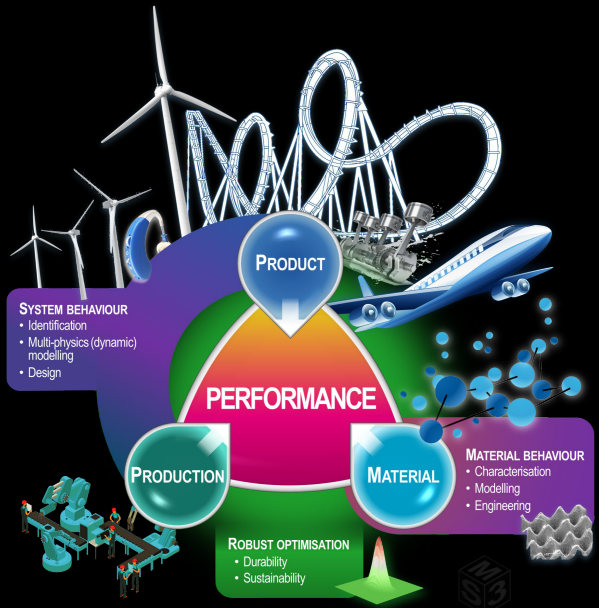
2. Nonlinear dynamics: Vibrations, multibody dynamics, flexible bodies, dynamic testing



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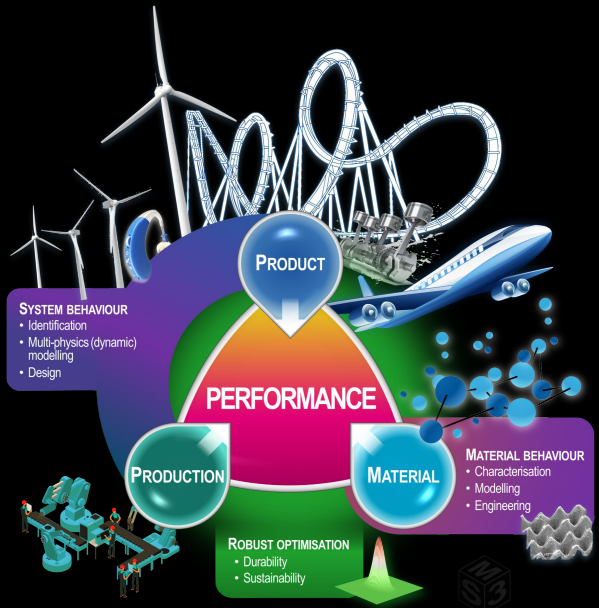

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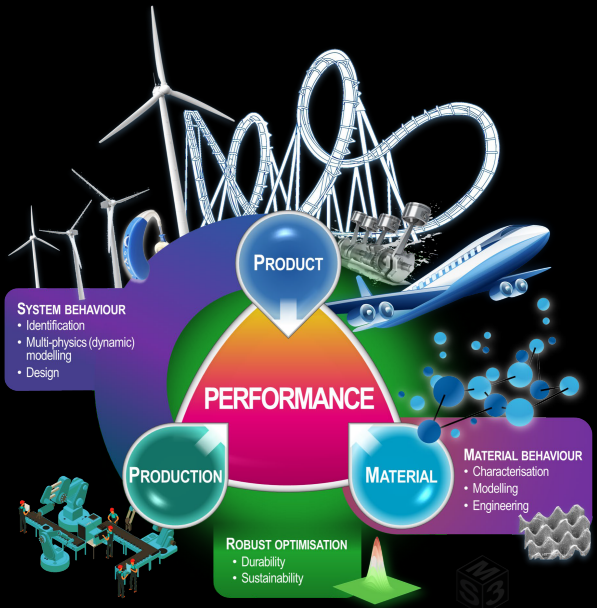
4. Robust optimization and control of production processes: Composites manufacturing, steel manufacturing processes



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Our students are trained to solve industry's problems of today and tomorrow and our research is directed to develop the technology needed to be successful in the long run

Presentations MSc Students

Information MSc Specialization

dr.ir. Richard Loendersloot

University of Twente

04.04.2024.

PROGRAM

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High Tech Systems and Materials Education

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04.04.2024.

EDUCATION

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

But how to choose courses?

EDUCATION – 1st QUESTION

WooClap Question – Which topic do you like most?

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

EDUCATION – MAYBE EASIER

WooClap Question – Rank the BSc Modules. 1: most favourite, 9: least favourite.

1. Design & Manufacturing
2. Energy & Materials
3. Energy & Sustainability
4. Design & Mechanics
5. Dynamic Systems
6. Product Design
7. Fluid Mechanics & Heat Transfer
8. Mechatronic Design
9. Production Systems Engineering

EDUCATION – OR EVEN EASIER?

WooClap Question – From all BSc Courses, select your top-5 most favourite courses:

1. TIME
2. Calculus 1A
3. Calculus 1B
4. Calculus 2
5. Linear Algebra
6. Vector Calculus
7. Statistics
8. Modelling & Programming 1
9. Modelling & Programming 2
10. Modelling & Programming 3
11. Modelling & Programming 4

1. Statics
2. Mechanics of Materials
3. Elasticity Theory
4. Introduction to Finite Element Method
5. Dynamics 1
6. Dynamics 2
7. Material Science 1
8. Material Science 2
9. Processing & Properties of Polymers
10. Engineering Thermodynamics 1
11. Engineering Thermodynamics 2

1. System Analysis
2. System & Control Engineering
3. Tribology
4. Fluid Mechanics 1
5. Heat Transfer
6. Manufacturing
7. Technical Product Definition
8. Machine Elements
9. Life Cycle Analysis
10. Systems Engineering
11. Production Management

EDUCATION – IN ADDITION

WooClap Question – What fits you best? I want:

1. To work on/with an experimental set-up
2. To work on/with a numerical model
3. To work in an industrial environment
4. To work in a research environment
5. To work in an academic environment
6. To work in an engineering consultancy firm

EDUCATION – AND EVEN FURTHER

WooClap Question – What is your ambition? I want:

1. To be challenged
2. To change the world of tomorrow
3. To save the planet
4. To be the best in my field
5. To make a decent living
6. To create products / systems
7. To enable the creation of new products / systems
8. To improve products / systems
9. To explore how things work
10. To become filthy rich

EDUCATION – CROSSING BORDERS

WooClap Question – Have you ever considered a Double Degree Master with Institúto Tecnológica Aeronautica (Brasil):

1. Yes!
2. No
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https://www.utwente.nl/en/me/master_programme/double-degree/

EDUCATION – MSC ASSIGNMENTS

MSc Graduation Projects are always in collaboration with a research group, mostly of the department Mechanics of Solids, Surfaces & Systems (MS^3)

https://www.utwente.nl/en/et/ms3/

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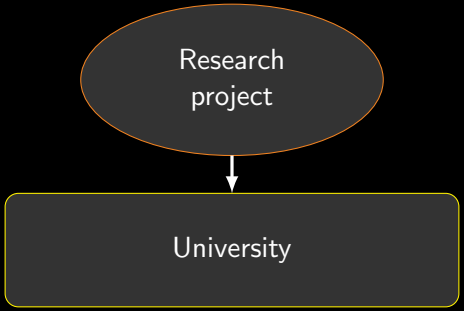

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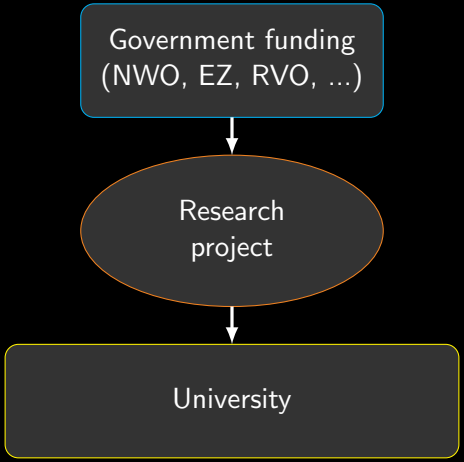

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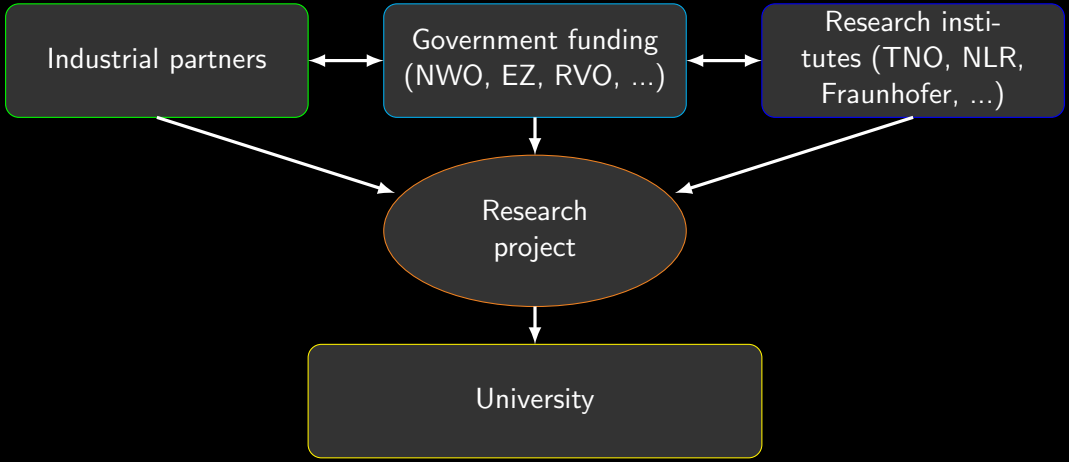

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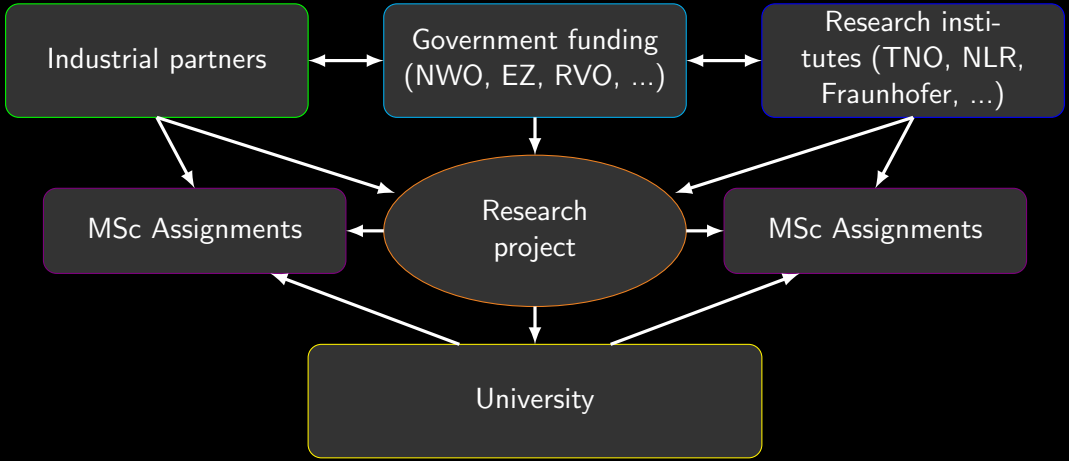

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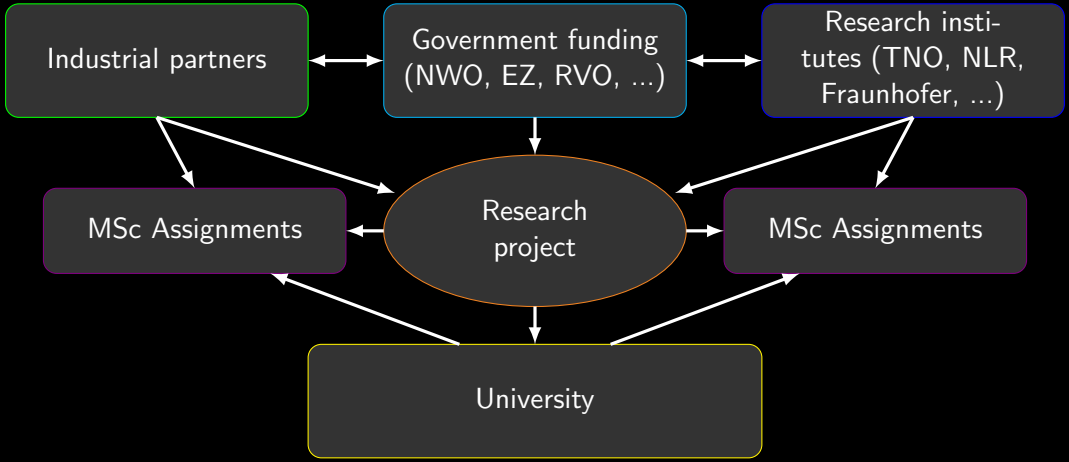

The collaboration with industry guarantees industrial relevance of the assignment

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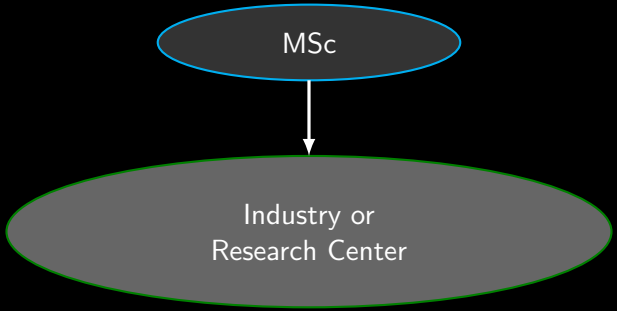

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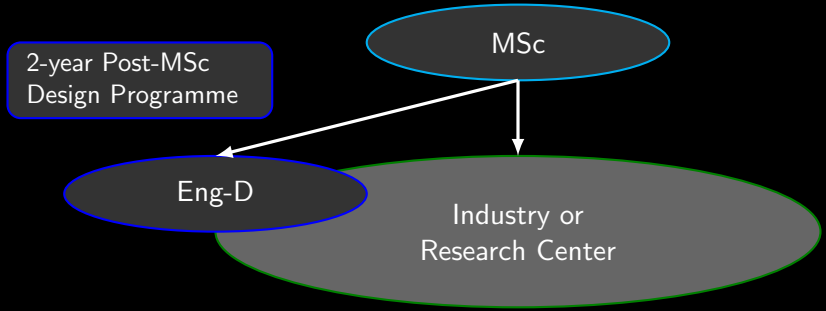

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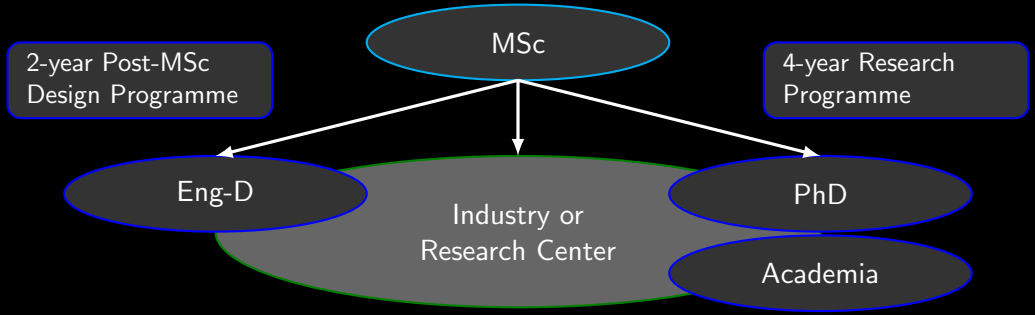

Closing Remarks

Information MSc Specialization

dr.ir. Richard Loendersloot

University of Twente

04.04.2024.

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