

Faculty of Science and Engineering

Profile report: Mechanical Engineering - Dynamics and Vibration (Dynamica en trillingen)

- Discipline: *Dynamics; Vibration; Mechanical Engineering; High Precision; Extreme Environments;*
- Level: Full professor
- Fte: Full time (1,0)

1. Scientific discipline

Mechanical engineering with a focus on dynamics and vibrations. The research might include structural dynamics and mechanics, structural health monitoring, nonlinear dynamics, nonlinear oscillations in discrete and continuous systems, and vibration protection and mitigation.

2. Vacancy

This position is opened by the Board of the Faculty of Science and Engineering (letter with reference JK/gl/15/00712) and will be embedded in the institute Engineering and Technology Institute (ENTEG), new basic unit Dynamics and Vibration. The position falls within the framework of 'Career Paths in Science 3' ('Bèta's in Banen 3'). Please see link for [criteria and conditions](#).

3. Selection committee (BAC)

- Prof. Dr. Ir. J.M.A. Scherpen (chair, director ENTEG)
- Prof. dr. B. Jayawardhana (DTPA, ENTEG)
- Prof. dr. Y. Pei (APE, ENTEG)
- Prof. dr. A van den Berg (KVI-CART)
- Prof. dr. ir. E. van der Giessen (ZIAM)
- Prof. dr. M. Cao (DTPA, ENTEG, adjunct director IEM master program)
- Prof. dr. ir. J. Dankelman (3ME, TUDelft, to be confirmed)
- Student member

Advisors

- Mr. H. Y. Haagsma (HR advisor)
- Dr. A. Vakis (APE, ENTEG)

4. Research area

Dynamics and vibrations occur in many physical systems and technologies, ranging from MEMS sensors and devices, to air and space structures or the development of novel materials. The research includes experimental, computational, and theoretical research components on topics such as nonlinear vibrations, flow-induced vibrations, nonlinear dynamics of slender structures, thermoacoustics, etc.

The analytical, numerical and experimental study of complex (nonlinear) mechanical systems, such as those experiencing tribological (contact and friction) or impact phenomena as well as those with a large number of degrees of freedom, are key activities. Such systems play an essential role in the modeling and analysis of advanced mechanical systems, and can be used in vibration damping, for example, via targeted energy transfer. The research on such

nonlinear phenomena is highly relevant to engineering applications (e.g. high-performance/high-precision advanced instrumentation). The strength of the research lies in combining theoretical techniques and numerical tools for analysis with dedicated experimental studies, which jointly provide insight into how to tame or exploit nonlinearity in the design of mechanical systems.

5. Embedding: institute (and basic unit)

The research conducted at the Engineering and Technology institute Groningen (ENTEG) is multidisciplinary and covers a broad area of mechanical engineering, materials and production engineering, chemical engineering, biotechnology, and systems and control engineering. Though multidisciplinary, the coherence is evident when considering the common design and development approach to the creation and manufacture of innovative products and production strategies.

The candidate will create and chair a new basic unit in the direction of Mechanical Engineering with a focus on Dynamics and Vibration. This new unit will have close research and teaching links to the other Mechanical Engineering oriented units of ENTEG - the basic units Advanced Production Engineering (APE), Discrete Technology and Production Automation (DTPA), and Smart Manufacturing Systems (SMS). APE focuses on mechanical precision engineering and on material science. Research within DTPA and SMS, on the other hand, focuses on the dynamical modeling, analysis, control and systems engineering of complex systems with applications to electro-mechanical systems.

Next to the mentioned to-be-created new basic unit with a focus on Dynamics and Vibration, two additional new basic units will be created. One in the direction of Mechanical Engineering with a focus on Process Design for Energy Systems and one with a focus on Engineering Materials.

6. Local and (inter)national position

The mechanical engineering research at the University of Groningen is unique because engineering research is embedded within a comprehensive university. Within the Faculty of Science and Engineering of the University of Groningen, fundamental research on materials mainly is done at the Zernike Institute for Advanced Materials.¹ The Kapteyn Astronomical Institute² of the same faculty creates innovative instruments for telescopes both earth bound and in space. ENTEG has a unique close collaboration with SRON³ for astronomical instrumentation, with KVI-CART⁴ for medical instrumentation and the *Innovatiecluster Drachten* for Smart Industry.⁵ The new basic unit in the direction of Dynamics and Vibration should focus more on a design and development approach to be utilized for possible applications in advanced instrumentation, smart factory, and other relevant application areas.

In the Netherlands, research in Mechanical Engineering is done at Delft University of Technology, Eindhoven University of Technology and University of Twente. Connecting with research groups that are related to Dynamics & Vibration at these universities is foreseen. International collaborations with relevant research groups are expected as well.

¹ See <http://www.rug.nl/research/zernike/>

² See <http://www.rug.nl/research/kapteyn/>

³ See www.sron.nl

⁴ See <http://www.rug.nl/kvi-cart/>

⁵ See <https://www.icdrachten.nl/>

7. Expected contributions to research

The candidate is expected to initiate and set up his/her own basic unit and research line in the field of Dynamics and Vibration.

The research should have good (inter)national visibility, outstanding reputation and lead to publications in top journals. Furthermore, in second instance, publications at well-known, high quality, scientific conferences are important. The research is expected to cross-fertilize the existing research within the institute and should lead to a strengthening of the international reputation of the group and the institute as well as other research institutes of the faculty.

Obtaining substantial external funding is crucial. The candidate is expected to demonstrate leadership in the research area and to coach one young tenure track assistant professor that will also be embedded in the new basic unit. Supervision of PhD students is an important part of the research activities.

8. Expected contributions to teaching

The candidate will contribute 40% of his/her time to the teaching programs at the University of Groningen, in particular the Bachelor's and Master's degree programs in Industrial Engineering and Management,⁶ Applied Physics⁷ and other engineering programs.

The candidate is expected to become actively involved in the to-be-developed Master's degree program in Mechanical Engineering (start date September 2019) and teach dedicated courses.

9. Expected contributions to the organization

The candidate is expected to have an active interest and to provide a positive contribution to the management and organizational tasks of the institute. At the level of the Faculty of Science and Engineering, the candidate will contribute to the organization of the faculty, for example by participating in working groups and committees, in the fields of teaching, research and management. The candidate will participate in relevant national and international organizations.

⁶ Details of the BSc IEM program can be found in <http://www.rug.nl/ocasys/fwn/vak/showpos?opleiding=3753> and that of the MSc IEM program can be read in <http://www.rug.nl/ocasys/fwn/vak/showpos?opleiding=3754>

⁷ Details of the BSc Applied Physics program can be found in <http://www.rug.nl/ocasys/fwn/vak/showpos?opleiding=4967> and that of the MSc Applied Physics program can be read in <http://www.rug.nl/ocasys/fwn/vak/showpos?opleiding=3377>