Faculty of Science and Engineering

Profile report: Systems and Control Engineering

Discipline: systems and control, robotics
Level: Educational Tenure-track assistant professor
Fte: 1,0 fte

1. Scientific discipline

The research activities in the area of systems and control engineering focus on developing quantitative and analytical theories and methodologies using mathematical models for the design and control of complex industrial processes and systems. The application area can be found in e.g., robotics, sensor networks, micro-assembly systems, energy systems and mechatronic systems.

This position will focus on the introduction of modeling- and control-related knowledge for various courses in the Bachelor and Master programmes in Industrial Engineering & Management and Mechanical Engineering. The research activities of the candidate should support existing research lines in the research unit Discrete Technology and Production Automation (DTPA) within the Engineering and Technology institute Groningen (ENTEG).

2. Vacancy

This position is opened by the Board of the Faculty (PT/gl/22/0337) and will be embedded in ENTEG, basic unit DTPA. The criteria and conditions pertaining to the position are described in the document 'Assistant professor with an education profile'.

3. Selection committee (BAC)

- Prof. dr. F. Picchioni, Professor Product Technology, Educational director, ENTEG, chair;
- Prof. dr. H.J. Heeres, Professor Chemical Reaction Technology, Scientific director, ENTEG;
- Prof. dr. J. Scherpen, Professor Discrete Technology and Production Automation, Director of Engineering; ENTEG
- Prof. dr. M. Cao, Professor Networks and Robotics, Director Jantina Tammes School; ENTEG
- Prof. M. Ghandchi Tehrani, Professor Dynamics and Vibration; ENTEG
- Prof Stephan Trenn, Professor Mathematics: Bernoulli
- Dr. M. Mazo Espinosa, Associate Professor, Systems and Control, TU Delft
- Student (tba)

Advisors:

- Prof. dr. B. Jayawardhana, Professor Mechatronics and Control of Nonlinear Systems Programme Director Master Mechanical Engineering; ENTEG
- F. Salverda, HR advisor, ENTEG

- Dr. K.E. Voskamp, Scientific coordinator, ENTEG

4. Area of expertise

The Systems and Control research in Groningen is recognized for its long tradition in mathematical systems theory and its strength in nonlinear systems analysis and control, multi-physics modeling of large-scale systems, coordination control of complex systems, and control under communication constraints. Recent additions include advanced manufacturing systems and systems biology.
Systems and Control is an interdisciplinary methodology, which functions as a common interface between various scientific disciplines and engineering areas, and often as an enabling technology. At the University of Groningen, it expands this integrating role towards chemical engineering, applied physics, computer science, artificial intelligence, biology, medicine, sociology and economics.
The candidate is expected to contribute to the strengthening of the systems and control engineering in relevant educational programmes. This will particularly involve the development of new ideas/concepts for example in the fields of robotics, mechatronics, and signals & systems. Also, the candidate will be involved in the development of the control engineering line in the relevant educational programmes and supervise student projects.

5. Embedding: institute (and base unit)

The research institute ENTEG (www.rug.nl/enteg) is the engineering science and technology institute of the Faculty of Science and Engineering of the University of Groningen. ENTEG research is highly multidisciplinary in nature and focuses on fundamental and engineering research on the development of new and innovative processes and products. The research of ENTEG is conducted in three key research domains:

- the application of fundamental sciences to the design of new (sustainable) product and research in the area of product and production technology for (bio)chemical-based products,
- the development of quantitative and analytical theories and methodologies for model-based design and control of complex industrial processes and systems and,
- advanced production engineering aiming at improving the production processes of increasingly complex materials.

The candidate is expected to contribute to the existing teaching and research activities within the DTPA group. DTPA currently consists of 3 full professors and 2 tenure track assistant professors and a substantial team of PhD students and postdoctoral fellows. The staff strongly links to the degree programmes in Industrial Engineering and Management, Mechanical Engineering, Biomedical Engineering and the Systems and Control Master degree programme that will start in September 2023.
Research within DTPA is focused on the design of new or improved control systems. The research activities are generally framed in a smart industrial or energy systems context.

As such, the use of control theories and techniques is a further objective of the research. In terms of research the candidate is expected to contribute to the existing activities within the DTPA group in the general field of systems and control.

6. Local and (inter)national position

The staff of the DTPA unit together are the core teaching staff of the Industrial Engineering and Management, Mechanical Engineering and Systems and Control programmes of the University of Groningen. The teaching activities will also interact closely with the education plans within the Jantina Tammes School, which has a strong interest to develop new teaching initiatives for students across faculties. Projects that fit into the challenge-based learning approaches are specifically needed.

Our programmes are unique in the north of the country and attract a significant number of students each year. Nationally there are strong collaboration with other universities, e.g. TU Delft, TU Eindhoven and University of Twente; internationally, the educational activities benefit through strong collaboration for international research projects, with e.g. TU Munich, Germany, CNRS, France, KTH, Sweden and Politecnico di Torino, Italy.

7. Expected contributions to teaching

The candidate will at the level of Assistant Professor contribute 60% of his/her time to the degree programmes at the University of Groningen. More specifically, the candidate is expected to take a leading role in innovating the teaching and assessment methods for DTPA courses mentioned before. This includes, although not limited to, robotics, mechatronics, and signal & systems. Typical examples of courses for which involvement of the candidate is foreseen are “Robotics” (Master programme Industrial Engineering and Management (IEM)), “Mechatronics” (Bachelor programme IEM), “Signal & Systems” (Bachelor IEM) as well as new courses focusing on modeling and control aspects for the aforementioned fields.

Innovation in the mode of assessment and instruction for Bachelor and Master projects along the guidelines in an industrial context is also highly desirable. In the same context, the candidate is expected to contribute to the further development of the learning line of control engineering in for example Industrial Engineering and Management, Mechanical Engineering and Systems and Control.

The candidate is also expected to be involved in the competence development of students and particularly those relevant for project works. All activities should provide students with the required mindset, knowledge, competencies and skillsets required in the industry of the future.

Finally, it is appreciated if the candidate applies for external funding, in particular for specific teaching grants (e.g. EIT, Erasmus plus, local funds) and contribute to strengthening the international reputation of the degree programmes.

8. Expected contributions to research

The candidate will at the level of Assistant Professor contribute 30% of his/her time to set up an own research line within the DTPA unit. The research line will be related to the

ongoing activities in this unit. The DTPA group is already playing a pivotal role in national and international research projects of this nature. The candidate is expected to reinforce the research profile of the DTPA group.

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 FSE, the candidate will contribute to the organization of the faculty, for example by participating in working groups and committees in the area of education. The candidate will participate in relevant national and international organizations.