

# Development Dialogue

## **Systems & Control**

Enschede, 15 June 2018

### Introduction

After three days of visitations on 13-15 June 2018 in Eindhoven, Delft, and Twente, the visitation committee consisting of Prof. Arjan van der Schaft (Rijksuniversiteit Groningen), Prof. Jan Lunze (Ruhr-Universität Bochum), Prof. Robert-Jan Simons (Universiteit van Tilburg) and the MSc students and the representatives from industry<sup>1</sup> had a good view of the three programs. In the development dialogue on 15 June, the committee gave suggestions for improvements of the programs and, in particular, for the cooperation between the three institutions.

### Position of Systems & Control

The committee considers it unclear what 'Systems & Control' actually is: is it a theory, a methodology or a toolbox? In fact, it is all, but this is not made explicit. The report<sup>2</sup> on Systems and Control for the Future of Humanity that was cited in the self-reflections is too extensive to find an answer. The committee recommends to *formulate a shared vision* of the field and the core of Systems & Control, and to *write a paper on the position of the discipline*. It recommends to involve students in this process, because during the interviews the students gave an excellent description of the field.

### 4TU cooperation

Although the three institutions never created a shared program, they do collaborate intensively. The contacts and the infrastructure are excellent, and certainly DISC is a good base to work from. The committee advises to decide to *continue to collaborate*, using new ways. A few suggestions from the committee are:

- Joint virtual courses
- Exchange of master theses
- Annual student days
- Extension of DISC to MSc
- Student competitions

### Content S&C programs

The three programs have different flavors. The committee appreciates this: after all, the institutions operate in different environments in The Netherlands and within their universities. However, all three programs have a very theoretical basis. *Techniques and applications to implement these modeling, control, and identification theories* are underrepresented in the three programs. Although students in general have learned to implement control systems in the bachelor, this is not sufficient: there should be attention for this in the master as well. Besides this, the committee advises to include courses on generic modelling principles and soft skills in the compulsory part of the program.

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<sup>1</sup> In Delft: Ir. Rogier van der Groep from Siemens and Maurice Poot, BSc, from TU Eindhoven.

<sup>2</sup>Systems & Control for the Future of Humanity. Research agenda: current and future roles, impact and grand challenges. *Annual Reviews in Control*, **43** (1-64) 2017.

### Multidisciplinarity

The committee is happy with the existence of an independent Systems & Control program at each of the three Dutch technical universities. In other universities, Systems & Control is part of the Electrical Engineering discipline. According to the committee having an independent program has advantages but may go at the expense of multidisciplinarity. Therefore, it is *important to stay in contact with other concepts and disciplines*. This needs more attention, effort and emphasis from the program management.

### Internationalization

Due to the compulsory courses in the first year and the large master thesis in the second year, there are few opportunities for students to go abroad without incurring study delay. The committee recommends to *create more space in the programs for internationalization, e.g., an opportunity to study aboard*. At least one third of the students should gain international experience.

### Students

Systems & Control covers a broad range of theories and tools in very different application areas. Also the inflow and character of students vary per university. In Twente, there are almost no students from Electrical or Mechanical Engineering, while in Delft and Eindhoven they form the majority, in Delft in particular the Mechanical Engineering students. This causes different profiles of the graduates. The committee experienced much pride among students in Delft and Eindhoven and encourages Twente to draw attention to the team spirit. All students agreed on the fact that the study is tough and that the programs have a high study load.