



## **Modeling and control of nonlinear and distributed parameter systems : The port Hamiltonian approach**

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# Foreword

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**1. Lecturers**

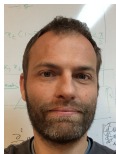
**2. Schedule of the course**

**3. Material/Examination**

**4. Objectives**

## Lecturers

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## Schedule of the course

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### Monday :

14 :30 - 14 :40 : Welcome-Practical Informations

14 :40 - 16 :00 : Introduction - Modeling of finite and infinite dimensional port Hamiltonian Systems (PHS)

Break

16 :30 - 18 :00 : Tutorial (1)

### Tuesday :

9 :00 - 10 :30 : Control of finite-dimensional PHS

Break

11 :00 - 12 :30 : Tutorial (2)

Lunch

14 :30 - 16 :00 : Well-posedness of infinite-dimensional PHS (1)

16 :30 - 18 :00 : Well-posedness of infinite-dimensional PHS (2)

### Wednesday :

9 :00 - 10 :30 : Control of infinite-dimensional PHS

Break

11 :00 - 12 :30 : Tutorial (3)

## Schedule of the course

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### Thursday :

9 :00 - 10 :30 : Transfer functions and dynamic control

Break

11 :00 - 12 :30 : Tutorial (4)

Lunch

14 :30 - 16 :00 : Applications (1)

16 :30 - 18 :00 : Applications (2)

### Friday :

9 :00 - 10 :30 : Open research problems (1)

Break

11 :00 - 12 :30 : Open research problems (2)

# Material/Examination

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- Course Material

- Pdf version of the slides
- Tutorials

Available on : <http://events.femto-st.fr/MCDPS-PHS/en>

- References (cf slides)

- Books

- PHS

- ▶ A. v.d. Schaft and D. Jeltsema (2014). Port-Hamiltonian Systems Theory : An Introductory Overview. Foundations and Trends in Systems and Control, vol. 1, no. 2-3, pp. 173-378 (<http://www.math.rug.nl/arjan/DownloadVarious/PHbook.pdf>).
- ▶ V. Duindam, A. Macchelli, S. Stramigioli H. Bruyninckx (2009). Modelling and control of complex systems. The port-Hamiltonian approach, Springer.

- DPS

- ▶ J. A. Villegas (2007). A port-Hamiltonian Approach to Distributed Parameter Systems. PhD thesis, Universiteit Twente (<https://ris.utwente.nl/ws/portalfiles/portal/6041262>)
- ▶ B. Jacob and H.J. Zwart (2012). Linear Port Hamiltonian Systems on Infinite-dimensional Spaces, Birkhuser Basel.
- ▶ Y. Le Gorrec, A. Ran and H.J. Zwart (2017). Control of distributed parameter systems. Lecture notes.

# Objectives

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This course is an introduction to **modeling** and **control** of **nonlinear and distributed parameter systems** by using the **Port Hamiltonian framework**. More precisely the objectives are :

- to provide some basic background on **physically based modeling**.
- to **illustrate** these modeling concepts on some **well known physical examples**.
- to provide some basic background on **analysis and stabilization of finite and infinite dimensional systems**.
- to provide an **overview of power/energy based control technics** and their use for practical controller derivations.





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Questions ?