

Rolling Stock Summer School 2023

Politecnico di Milano

July 17th to 21st 2023

Report



**POLITECNICO
MILANO 1863**

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LECCO



University of
HUDDERSFIELD

Introduction

Following the successful previous Summer Schools in 2010, 2012 and 2014 in Krakow and in 2016 in Lecco the Rolling Stock Summer School was again held in Lecco at the Politecnico di Milano where it took place from 17th to 21st July 2023. Professor Stefano Bruni and Professor Egidio Di Gialleonardo (Politecnico di Milano) and Professor Simon Iwnicki (University of Huddersfield) were the organisers.

The Summer School was held in the form of an intensive short course, of one week duration, for students starting a postgraduate degree in a Rolling Stock related topic and people from the railway industry working in R&D departments. The lectures were given by experts from Universities across Europe and industry guests, speaking on topics related to their expertise and experience.

The aims of the course were:

- For students to gain a broad background knowledge of the field outside their area of specialism at or near the start of their postgraduate studies;
- For industrial R&D to be presented with typical mathematical models (and simulation techniques) in the field of railway dynamics;
- To give students an overview of the latest research being carried out in relevant areas from the academic experts;
- To set up links between students from different institutions and thus encourage future networking.

Venue

The School was held at the at Politecnico di Milano, Polo territoriale di Lecco, Lecco, Italy. Students were lodged in the “Adolf Loos” student’s residence, inside the Lecco Campus of Politecnico di Milano. Lecturers were accommodated at Hotel Alberi, located at short distance from the campus.

Attendees

The School was attended by 29 students from 8 different European countries. The gender split was 27 male and 2 female participants.

Out of the total of 29 attendees, 3 were industrial researchers and 26 were PhD students and researchers from Universities. A complete list of the attendees is reported below in Table 1.

| Name | Surname | University / Company |
|----------------|---------------------|---|
| IRATI | MENDIA GARCIA | CAF I+D |
| Eric | Voortman Landström | Chalmers University of Technology |
| Henrik | Vilhelmson | Chalmers University of Technology |
| Kourosh | Nasrollahi | Chalmers University of Technology |
| Prapanpong | Damsongsaeng | KTH Royal Institute of Technology |
| Sai Kausik | Abburu | KTH Royal Institute of Technology |
| Yanjun | Zhang | KTH Royal Institute of Technology |
| Bastian | Schick | KTH Royal Institute of Technology Stockholm, Sweden |
| Arianna | Cavallo | Politecnico di Milano |
| Carlos Esteban | Araya Reyes | Politecnico di Milano |
| Federico | Castellini | Politecnico di Milano |
| Francesco | Mazzeo | Politecnico di Milano |
| Gioele | Isacchi | Politecnico di Milano |
| Gonzalo | Crespi | Politecnico di Milano |
| Leonardo | Faccini | Politecnico di Milano |
| Matteo | Santelia | Politecnico di Milano |
| Mattia | Belloni | Politecnico di Milano |
| Philipp | Leibner | RWTH Aachen - Institute for Rail Vehicles and Transport Systems |
| Simon | Klamt | RWTH Aachen - Institute for Rail Vehicles and Transport Systems |
| Sina | Shahidzadeh Arabani | Sapienza Università di Roma |
| Claudio | Colao | Technische Universität Berlin |
| Jonas | Vuitton | Technische Universität Berlin |
| Fabian | Wendrock | Technische Universität Dresden |
| Raül | Acosta Suñé | UCLouvain |
| Giovanni | Bellacci | Università degli Studi di Firenze |
| Lorenzo | Ghidini | University of Brescia |
| Jiri | Slapak | University of Pardubice, Faculty of Transport Engineering |
| Jan | Pulda | VÚKV a.s. |
| Jan | Pejša | VÚKV a.s. |

Table 1: List of attendees

Lecturers

The lectures were given by leading experts from across Europe, including senior academics and industry R&D leaders, speaking on topics related to their expertise and experience. A list of the lecturers involved is given below in table 2.

| | |
|------------------------------|---|
| Prof. Mats Berg | KTH, Sweden |
| Prof. Stefano Bruni | Politecnico di Milano, Italy |
| Mr. Steven Cervello | Lucchini RS, Italy |
| Prof. Egidio Di Gialleonardo | Politecnico di Milano, Italy |
| Mr. Ingo Kaiser | DLR, Germany |
| Prof. Simon Iwnicki | University of Huddersfield, UK |
| Dr. Tomáš Michálek | University of Pardubice, Czech Republic |
| Prof. Oldrich Polach | Bombardier Transportation, Switzerland |
| Prof. Paolo Schito | Politecnico di Milano, Italy |
| Prof. Jordi Vinolas | CEIT, Spain |

Table 2: List of lecturers

Programme

The course started on Monday July 17th with a welcome and introduction from the Organisers. The programme, held across the week included lectures, two computer hands-on session and a final discussion of group exercises which were assigned to the students on the starting day of the week.

Students and lecturers had meals together at lunchtime and dinner and were able to socialise in the evening, where they had opportunities to get to know each other and to further discuss about the contents of lectures and their research activities.

The detailed programme of the week is shown in the next page (initials are used to identify the lecturers).

| | Monday 17 July | Tuesday18 July | Wednesday 19 July | Thursday 20 July | Friday 21 July |
|---------------|---|---|---|---|---------------------------|
| 08.30 - 09.45 | Arrive | Modelling of rolling contact (IK) | Traction mechanics (TM) | Railway vehicle aerodynamics (PS) | Group presentations |
| 09.45 - 11.00 | | Design of bogies and running gears (OP) | Challenges in railway vehicle design and development (OP) | Vehicle -track interaction (JV) | |
| 11:00 | | Coffee | Coffee | Coffee | Coffee |
| 11.30 - 12.45 | | Modelling of suspension components (MB) | Recent innovations in Railways (SI+SB) | Work on group exercise | Closing remarks (SB, EDG) |
| 12.45 - 13.30 | | lunch | lunch | lunch | lunch |
| 13.30 - 14.45 | Welcome, Introduction, Aims (SB, EDG, SI) | Introduction to computer simulation, class 1 (IK) | Computer simulation Hands-on session class 2 (IK) | Testing and qualification of railway vehicles (EDG) | Depart |
| 14.45 - 16.00 | Architecture of railway vehicles (SB) | Introduction to computer simulation, class 2 (IK) | Computer simulation Hands-on session class 1 (IK) | Fatigue tests in axles (SC) | |
| 16:00 | Coffee | Coffee | Coffee | Coffee | |
| 16.30 - 17.30 | Wheel-Rail contact (SI) | Wheel and Rail damage mechanisms (SI) | Visit of the labs | Work on group exercise | |
| 17.30 - 18.30 | Intnroduction to group exercise (SI) | Work on group exercise | Work on group exercise | | |
| 19:30 | Dinner | Dinner | Dinner | Dinner | |

Table 2: Detailed programme of the summer school (initials are used to identify the lecturers).

Didactic material

Didactic material was prepared by all lecturers, in the form of slides. All slides, together with integrations, were uploaded on a webfolder accessible to all lecturers and to all students, so that everyone involved with the summer school was able to obtain the complete set of didactic material.

Photos

Several photos were taken during the week and were distributed to the participants (students and lecturers) via the webfolder. A selection of photos is presented below.





Acknowledgements

- The time of all the organisers and lecturers has been provided free of charge by themselves and their Institutions.
- The International Association for Vehicle System Dynamics (IAVSD) offered a financial support to help the school with meeting the financial balance, in case of need.
- The dinner on Thursday was kindly sponsored by Lucchini RS.

The organisers gratefully acknowledge this support.

The organisers of the Summer School

Prof. Stefano Bruni, Politecnico di Milano, Italy

Prof. Egidio Di Gialleonardo Politecnico di Milano, Italy

Prof. Simon Iwnicki, The University of Huddersfield, UK