

**Preliminary Program**

ARCHIEF

**Summer School  
Control of Mechanical Systems**

*June 3-7, 1991 at Zeist,  
the Netherlands*



**Network System- en Regeltheorie**  
*Systems and Control Theory Network*

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The University of Groningen is responsible for the network administration.

The publication date of this Preliminary Program is April 1991.

## Invitation to participate

The organizers have the pleasure to invite you to participate in the *Summer School Control of Mechanical Systems* that is scheduled for June 3-7, 1991 in Zeist, The Netherlands. The invitation is directed to doctoral students at universities in The Netherlands in the area of system theory and control engineering, to members of the network, and to Dutch researchers in system and control theory.

## Aim

The aim of the summer school is to provide knowledge on the subject of control of mechanical systems, such as for robots, space structures, and mechanical motion systems, by experts from abroad. A related aim is to bring the doctoral students of the network into contact with these specialists and to strengthen the ties between the students.

## Scientific program

Control of a robot arm, or of an automated crane, or of solar panels on a satellite, are problems that arise in current day engineering. Especially flexible mechanical systems may constitute very complicated structured dynamical systems. These engineering problems point to the need for control theory of mechanical systems and to the need for system theoretic models for mechanical structures. In response to these needs a research effort has been growing to develop system and control theory for mechanical structures. Linear and nonlinear systems for mechanical structures are Hamiltonian and may have special symmetry properties. Model approximation may be applied such that these properties are preserved. The synthesis methods of control laws for such systems are being developed. This summer school presents tutorial lectures on this development by researchers who are actively participating in this research effort.

The following specialists have been invited to lecture on the indicated topics:

### *Main lecturers*

- E.A. Jonckheere (University of Southern California, Los Angeles, USA),  
*Large space structures, model reduction, and identification*
- P.C. Müller (Bergische Universität-Gesamthochschule Wuppertal, FRG),  
*Modelling of mechanical systems*
- S. Sastry (University of California, Berkeley, USA),  
*Control with applications to mechanical systems*

### *Lecturers*

- G. Bastin and G. Campion (Université Catholique, Louvain-la-Neuve, Belgium),  
*Adaptive control of robotic manipulators, Feedback control of nonholonomic mechanical systems*
- A.J. van der Schaft (University of Twente, Enschede, The Netherlands),  
*Mathematical modelling and control of mechanical systems*
- J. de Schutter (Catholic University of Leuven, Belgium),  
*Force control of robots and compliant motion*
- M. Steinbuch (Philips Research Laboratory, Eindhoven, The Netherlands),  
*Modelling and robust control of electromechanical systems,*
- P. van Woerkom (National Aerospace Laboratory, Amsterdam, The Netherlands),  
*Control synthesis of large flexible spacecraft*

Participants are expected to be actively involved with the course content and will be invited to participate in small projects during the course week.

### **Lecture notes**

Registered participants can expect a copy of the lecture notes around May 13, 1991 to allow them to prepare for the presentations.

### **Registration**

To register for the summer school please complete the enclosed registration form and submit it to the address indicated on the form before May 10, 1991. Receipt of the registration form will be acknowledged.

Doctoral students (aio's and oio's) whose research advisor is a member of the Systems and Control Theory Network can participate free of charge. Their travel costs will be reimbursed by the network. Doctoral students are expected to arrive on Monday June 3, to depart on Friday June 7, 1991, and to share a room with a colleague. Members of the network may participate at the expense of the network although there is a restriction on the number of such participants. Members may also participate in only part of the program; they are requested to indicate this on the registration form. Others who would like to participate have to pay a registration fee of NLG 850,- in case that they use a twinbedded room and NLG 1000,- in case of a single room. The fee includes: admission to all sessions, a copy of the lecture notes and the final program, and lodging from Monday June 3 before lunch up to and including Friday June 7 afternoon lunch. Partial arrangements are possible but not encouraged. For information on partial arrangements contact the network office.

## Conference location

The meeting takes place in *Conferentiecentrum Woudschoten*, Woudenbergseweg 54, 3707 HX Zeist, The Netherlands, tel. 03439-1344. Accomodation is provided in the conference center. The center has lecture rooms, a dining room, and a bar. Recreational facilities available at Woudschoten include a volleyball field, a soccer field, and midget golf. At the Sportcentrum KNVB at about 1 km distance from the conference center there is a swimming pool that is available on payment at locally announced opening hours.

The *Conferentiecentrum Woudschoten* may be reached by public transportation from the railway station of Utrecht by bus line 81 in the direction Veenendaal leaving the station at Utrecht at 10 minutes after the hour during the main part of the day. Get off the bus at the busstop titled Woudschoten/Oud London. The bus ride takes about 35 minutes. From station Driebergen/Zeist one may reach the conference center by taxi in about 10 minutes. For the return trip the bus leaves the busstop near the conference center in the direction Utrecht at about 10 minutes past the hour. By car the center is easily reached by freeway and road. Travel directions will be mailed to registered participants.

## Organization

The organizing committee consists of prof.ir. O.H. Bosgra and dr. H. Nijmeijer. The summer school is an activity of the Onderzoekopleiding systeem- en regeltheorie (Graduate school of systems and control) offered by the Netwerk systeem- en regeltheorie (Systems and control theory network). For questions on the scientific program contact dr. H. Nijmeijer, Department of Applied Mathematics, Twente University, P.O. Box 217, 7500 AE Enschede, tel. 053-893442. For questions on the registration contact the network office, see the back of the front cover.

## Scientific program

### *Monday June 3*

09:00 - 10:15	Registration
10:15 - 10:30	Opening
10:30 - 11:30	P.C. Müller <i>Modelling of mechanical systems (1)</i>
11:30 - 11:45	Break
11:45 - 12:45	P.C. Müller <i>Modelling of mechanical systems (2)</i>
12:45 - 14:00	Lunch break
14:00 - 15:00	E.A. Jonckheere <i>Large space structures, model reduction, and identification (1)</i>
15:00 - 15:30	Break
15:30 - 16:30	E.A. Jonckheere <i>Large space structures, model reduction, and identification (2)</i>
18:30	Dinner

### *Tuesday June 4*

09:15 - 10:15	P.C. Müller <i>Modelling of mechanical systems (3)</i>
10:15 - 10:45	Break
10:45 - 12:00	P.C. Müller <i>Modelling of mechanical systems (4)</i>
12:00 - 13:30	Lunch break
13:30 - 14:45	S. Sastry <i>Control with applications to mechanical systems (1)</i>
14:45 - 15:15	Break
15:15 - 16:15	S. Sastry <i>Control with applications to mechanical systems (2)</i>
18:30	Dinner

### *Wednesday June 5*

09:15 - 10:15	E.A. Jonckheere <i>Large space structures, model reduction, and identification (3)</i>
10:15 - 10:45	Break
10:45 - 12:00	E.A. Jonckheere <i>Large space structures, model reduction, and identification (4)</i>
12:00 - 13:30	Lunch break
13:30 - 14:45	G. Bastin & G. Campion <i>Adaptive control of robotic manipulators</i>
14:45 - 15:15	Break
15:15 - 16:30	A.J. van der Schaft <i>Mathematical modelling and control of mechanical systems (1)</i>
18:30	Dinner

*Thursday June 6*

09:15 - 10:15 S. Sastry  
*Control with applications to mechanical systems (3)*

10:15 - 10:45 Break

10:45 - 12:00 S. Sastry  
*Control with applications to mechanical systems (4)*

12:00 - 13:30 Lunch break

13:30 - 14:45 P.Th.L.M. van Woerkom  
*Control law synthesis of large flexible spacecraft*

14:45 - 15:15 Break

15:15 - 16:30 J. de Schutter  
*Force control of robots and compliant motion*

18:30 Dinner

*Friday June 7*

09:15 - 10:30 G. Bastin & G. Campion  
*Feedback control of nonholonomic mechanical systems*

10:30 - 11:00 Break

11:00 - 12:15 A.J. van der Schaft  
*Mathematical modelling and control of mechanical systems (2)*

12:15 - 13:30 Lunch break

13:30 - 14:45 M. Steinbuch  
*Modelling and control of electromechanical systems*

14:45 - 15:15 Closing remarks and tea





# Summer School Control of Mechanical Systems

June 3-7, 1991 Zeist, The Netherlands

## Registration form

Please complete this registration form by checking the appropriate boxes and providing the requested information. Please type or use capital letters.

Please register me as a participant of the above mentioned meeting.

Surname:

Title and initials:

Mr.  Ms.

Office address:

Tel. office:

Research advisor (if applicable):

### *Arrangement*

Single room

Twinbedded room, please specify with whom you would like to share a room:

Day arrangement 1 consisting of lunch, coffee and tea on the day(s):

Day arrangement 2 consisting of lunch, dinner, coffee and tea on the day(s):

Other arrangement, please specify:

### *Payment*

You will be invoiced by the University of Groningen if payment is required.

### *Authentication*

Place:

Date:

Signature of applicant:

Signature of research advisor (if applicable):

The completed form should be received not later than May 10, 1991 by

Ms. G. Bijleveld

Office of Systems and Control Theory Network

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