



*Robotics and Automation Chapter of the IEEE Polish Section,  
Faculty of Electronics and Information Technology and  
Faculty of Power and Aeronautical Engineering of  
Warsaw University of Technology*

invite to the seminar on

## **The Geometry of Nonlinear Time-Delay Systems**

presented by **Claude H. MOOG**

Directeur de Recherche CNRS, Fellow of the IEEE

**22 of April 2016 at 14<sup>15</sup>** at the Faculty of Electronics and Information Technology, room 569

Time-delays are encountered in many fields, including Networked Control Systems, Biologic models, Teleoperations. Moreover such models are often nonlinear. When dynamics are fast, even small delays can hardly be neglected to maintain good performances.

The purpose of this talk is to focus on the structural aspects of this class of systems, and to show how far geometric tools can still cope with the delayed dynamics. Analysis and synthesis problems are argued as

- Controllability/accessibility and its characterization
- Observability
- Equivalence to a delay-free system
- Equivalence to a linear time-delay system, with or without feedback

The role a specific polynomial Lie Bracket is highlighted. The results obtained for this class of nonlinear time-delay systems is put in perspective with respect to the knowledge from linear time-delay systems and nonlinear delay free systems.



**Claude H. Moog** received the Ph.D. degree in automatic control and the “Docteur d’Etat” degree, both from the University of Nantes, France, in 1980 and 1987, respectively. Since 1983, he has been with the CNRS, and currently holds the position of “*Directeur de Recherche*”. He is a Fellow of the IEEE since 2007 and a Corresponding Member of the Mexican Academy of Sciences since 2012.

His research interests focus on theoretical aspects of nonlinear systems and control, with applications in robotics and biological systems. He coauthored a book on algebraic methods for nonlinear control systems with G. Conte and A.M. Perdon. He serves as an Associate Editor for *IEEE Transactions on Automatic Control*.