



ÇANKAYA UNIVERSITY  
FACULTY OF ARTS AND SCIENCES  
DEPARTMENT OF MATHEMATICS

# SEMINAR

## Bond Graphs

**SPEAKER** : Prof. J. A. Tenreiro Machado (ISEP, Porto, Portugal)

**DATE** : 24 April , 2017

**TIME** : 15:30

**PLACE** : Çankaya University (Central Campus), R-213

### Abstract

The concept of bond graphs ( $BG$ ) was originated by Paynter (1961) and the idea was further developed by Karnopp, Rosenberg, Thoma, and others, so that it evolved to a systems theory. A  $BG$  is a graphical representation of a physical dynamic system. Connections in  $BG$  represent bi-directional exchange of physical energy, while those in block diagrams and signal-flow graphs represent uni-directional flow of information.  $BG$  are a powerful tool for modeling engineering systems, especially when different physical domains are involved. In fact,  $BG$  are multi-energy domain, namely, mechanical, electrical, hydraulic, and several others.  $BG$  have the concept of causality, indicating which side of a bond determines the effort and which determines the flow.  $BG$  allow the conversion of the system into a state-space representation and numerical simulation by computer packages.

All interested are cordially invited.

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