



Control Systems for Nuclear Reactors

Thursday, 22nd March, 2007

Venue opens at 5:00pm for a 5:30pm start

Room 78-622, GP South

The University of Queensland, St Lucia Campus

Map (<http://www.uq.edu.au/maps/index.html?menu=1&id=71>)

Presented by: Professor Binjin Bandyopadhyay, Indian Institute of Technology Bombay, Mumbai, India

This is a rare opportunity to hear about some of the challenges involved in controlling the core of nuclear fission reactors.

Fission reactions taking place in nuclear reactors can give rise to the formation of several nuclear species. However, the Xenon isotope ^{135}Xe requires special attention with respect to the operation and control of thermal reactors. The oscillations of the neutron flux that are introduced by ^{135}Xe can be broadly classified in two categories: fundamental mode or global power oscillation and higher mode or spatial oscillations. Generally speaking global power oscillations are readily noticed and suppressed by a control system while spatial oscillations are not. Here the global reactor power can remain constant so that no change in the coolant outlet temperature is effected, the oscillations being in spatial distribution of power inside the core. If the spatial oscillations in a reactor are not controlled, a serious situation known as 'flux tilting' may arise i.e. one portion of the reactor may tend to produce more energy than the other portion does, and this can cause fuel in that region to exceed its thermal design limits. For this reason spatial oscillations have received more attention in literature. This talk will discuss how a nodal model for a large reactor can be obtained and then it will be shown that by using a kind of output feedback known as periodic output feedback, which uses only zonal flux, any desired closed loop specification can be obtained. Finally the application of the proposed method to a practical PHWR of 500 MW will be discussed.

Biography

BCV: B. Bandyopadhyay (S'83–M'88–SM'06) was born in Birbhum Village, India, in 1956. He received the Bachelor's degree in electronics and communication engineering from the University of Calcutta, Calcutta, India, and the Ph.D. degree in electrical engineering from the Indian Institute of Technology, Delhi, India, in 1978 and 1986 respectively. In 1987, he joined the Interdisciplinary Programme in Systems and Control Engineering, Indian Institute of Technology Bombay, Mumbai, India, as a Faculty Member, where he is currently a Professor and the Convener. He has authored or co-authored more than 200 journal articles and conference papers and two research monographs in Lecture Notes in Control and Information Science (Springer-Verlag). His research interests include the areas of large-scale systems, model reduction, reactor control, smart structures, periodic output feedback control, fast output feedback control, and SMC.

If attending could you please rsvp to Michael.Lees@ieee.org