# Department of Electronics & Communication Engineering

and

## PES CENTRE FOR INTELLIGENT SYSTEMS

present a lecture by

# Dr Sachin Prabhu

*University of Leeds, UK*

on

## Multiscale Modelling Approach and Application to Natural Systems

**Outline:** Typical engineering practice imposes simplifying assumptions on secondary system behaviour for mathematical tractability. In contrast, natural systems exhibit various complex behaviours at different spatio-temporal scales. Whilst modelling individual effects in a natural system is insufficient to develop useful insights into the overall behaviour, developing accurate models for system-wide behaviour is practically impossible. Ensuring mathematical tractability and accuracy requires scale separation to identify effects that can be modelled at individual scales and explore options for bridging knowledge gaps across scales. Such an approach is called multiscale modelling. This systematic approach is rapidly gaining popularity in research related to both engineering and natural systems alike. Multiscale modelling is quickly becoming the go-to method in high impact areas of research such as drug discovery and additive manufacturing.

In this lecture, an overview of multiscale modelling problem and principles of scale-separation, hypo-modelling, and hyper-modelling will be provided, and will include a quick introduction to different flavours of the multiscale problem. Two case studies – transcriptional regulatory network inference and clinical hip fracture risk prediction – will be used to demonstrate the steps involved in defining multiscale problems followed by a discussion on different combinations of traditional methods to obtain meaningful solutions. The lecture will be concluded with an attempt to paint a broader picture of personalised medicine where every aspect of the underlying model from molecular scale to epigenetic scale is tailored to the needs of an individual.

**Dr. Sachin Prabhu** is with the School of Chemical and Process Engineering, University of Leeds, where he is involved in several projects spanning industrial and biomedical applications and is presently a co-investigator in research related to monitoring and control of pharmaceutical powder blending process. He obtained his Ph.D. in Automatic Control and Systems Engineering, University of Sheffield, UK, and worked as a Postdoctoral Researcher prior to joining Leeds. He is an alumnus of Telecommunication Engineering of PES Institute of Technology where he completed his Bachelor of Engineering and Master of Technology in Intelligent Systems. He was awarded a gold medal by VTU in 2014 for his M.Tech. He has authored ten publications.

**Venue: B Block Seminar Hall (5th Floor), PES University**
**Date: 05 February, 1330–1430 hours**

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