## ***Short Biography***

***Dr P. Vivekananda Shanmuganathan*** (Vivek) is Professor of Mechanical Engineering at VIT University, Vellore, in India. He has over 10 years of teaching experience with VIT Univeristy since his PhD from Indian Institute of Technology, Bombay, India. He is currently visiting *Politecnico di Milano* in Milan, Italy, under the HERITAGE fellowship (the Erasmus Mundus Partnership Programme coordinated by EC-Nantes).

**Vivek** received his B.E. Degree in Mechanical Engineering from Madurai Kamaraj University, M.E. degree in Computer-Integrated Manufacturing from PSG College of Technology, Coimbatore, and Ph.D. Degree from IIT Bombay. His doctoral work was on *Underactuated hopping motion of Single- Legged robots*. He is currently consulting a for a project related to modeling of a dual-arm manipulator mounted on tracked army tank. His proposal on the studies on using myoelectric signals for robotic prosthetic device received a funding of Rs 2.167 Million from Government of India (2009-2011).

**Vivek's** research interests include Robotics and Multi-Body Systems, Vision, Virtual Reality and Haptics. He has 39 publications at national and international level to his credit. He has guided over 33 Master's level and 3 Bachelor's Projects. His current focus is Dynamic Modeling of Robotic Systems.

## ***Abstract of the Talk***

Robots for real life environments need to meet several factors: innovative and conceptual design[1], engineering design to realise the robot as a mechanical device[2], sensory capabilities[3], intelligence[4] for multisensor fusion and decisioning and, above all, the ability to respond dexterously[5] in a shorter time[6] and consuming less power[7]. In the past few decades, the focus of research in legged robots was on each of the first 4 factors individually or accounted one or more of them. On the other hand, dexterity and quick response are an essential part of dynamical interactions associated with realistic applications and for emulation of biological manipulation and mobility.

Modeling and simulation of robot dynamics is useful in evolving dexterous robots. Study of the stability issues arising out of nonlinear nature of robot dynamics helps in devising robots that are dexterous, energy-efficient, and optimally-designed. The talk will focus on the unpowered and underactuated motion of single-legged robot. The talk will thus show how an innovative change in design could result in useful dynamic behavior of the robot. A methodology for searching for trajectories for passive motion (unpowered motion) and underactuated motion (requiring fewer actuators) at least for a part of the motion cycle is discussed. The complexity in analyzing such a motion with an additional link in the leg configuration and a heuristic method that results in a periodic motion is highlighted.

The talk will also include briefly an introduction to VIT University and its academic and research directions.