FOUNDATIONS OF COGNITIVE ROBOTICS

PROF. BISHAKH BHATTACHARYA

Department of Mechanical Engineering

IIT Kanpur

INTENDED AUDIENCE : Students and industry experts

PREREQUISITES : School level science courses

INDUSTRIES APPLICABLE TO : Robotics Industry, Neuroscientists, Psychologists, Research scholars in the field of Social Robots

COURSE OUTLINE :

With the rapidly advancing process of inclusion of robots from Industry to the Social Arena, the functional requirement of the robots and corresponding human expectations have increased tremendously. However, in order to fully comprehend the complexities of such robot design, one needs to possess an over-all idea of the field. The objective of this course is to introduce students, researchers to this new field of robotics with the help of illustrative models, facts and relevant theories. The course has been designed by carefully maintaining a balance between biology, engineering and control system design so that it can attract a broad group of people interested in the interdisciplinary field.

ABOUT INSTRUCTOR :

Prof. Bishakh Bhattacharya is currently Professor at the Department of Mechanical Engineering and Head, Cognitive Science and Technology, IIT Kanpur. His research interest primarily lies in vibration control, structural health monitoring, energy harvesting system, intelligent system design, cognition and Child-Reconfigurable Robot Interaction. He is the coordinator of Space Technology Cell, IIT Kanpur and head of the SMSS (Smart Materials, Structures and Systems) Laboratory.

COURSE PLAN :

Week 1: Introduction
  Module 1: Introduction to Cognitive robotics and Human Robot Interaction
  Module 2: Smart materials-I
  Module 3: Smart materials-II
  Module 4: Smart materials-III

Week 2: Brain physiology and neural signal transmission
  Module 1: Architecture of the Brain
  Module 2: Architecture of the Brain (Contd.)
  Module 3: Nerve cells

Week 3: Neural modeling
  Module 1: Introduction to Synchronization Models
  Module 2: Synchronization Models (Contd.)
  Module 3: Electroencephalography (EEG)

Week 4: Intelligence architecture
  Module 1: Theories of Intelligence-I
  Module 2: Theories of Intelligence-II
  Module 3: Kuramoto Model
  Module 4: Child-Robot Interaction