Modelling and Analysis of Cyber Physical Systems

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Overview

Cyber physical systems (CPS) are the next generation embedded systems in which networked control systems tightly interact with physical systems. The application areas of CPS have been ever expanding and include emerging areas of Internet of Things (IoT) applications of personal health and home monitoring systems besides the traditional automotive, aerospace, transportation, home automation, hospital automation and healthcare systems. All these systems are software intensive and interact with physical environments, the two important aspects of CPS. Many of the applications are safety-critical in nature and requires systematic development approaches and rigorous verification practices. The emphasis of the course is on rigorous modelling and analysis of cyber-physical systems. The traditional model based development methodology would be extended to cyber-physical systems with a focus on system engineering aspects like systems modelling, simulation, and system decomposition. One of the highlights of the course is that various modelling abstractions and tools useful for modelling cyber-physical systems would be introduced and there would be plenty of opportunities for hands-on experience. We plan to make available the following tools: Simulink/Stateflow, SysML, Modelica and Event-B. Throughout the course, case studies and use cases from automotive, railway systems and Smart Grids will be used. It is also planned to have short projects involving modelling and simulation of different application areas. Another highlight of the course is its focus on testing and verification, which is taking a major effort in development of safety-critical systems. The participants would be exposed to state-of-the-art formal verification and model based testing methodology and tools. Finally, learning is becoming an important component of next generation CPS and hence this course will touch upon some elementary aspects of machine learning.

Modules	A: **Modelling of CPS** : **4-9 July** B: **Analysis and verification of CPS, case studies** : **11-14 July** **Number of participants for the course will be limited to fifty.**
You Should Attend If…	▪ you are a Computer Scientist, an Electronics engineer or a researcher in these areas interested in the design/analysis of Cyber Physical Systems. ▪ you are a student or faculty from academic institution interested in Cyber Physical Systems
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $500** **Industry/ Research Organizations: Rs. 20000** **Academic Institutions: Rs. 10000** The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

The Faculty

Prof. S. Ramesh is currently a senior technical fellow at General Motors Global R&D, USA, and is an adjunct faculty at IIIT Bangalore. At GM, he is responsible for providing technical leadership for research and development in several areas related to Electronics, Control & Software processes, methods, and tools. His areas of interests are Rigorous Software Engineering, Embedded Systems and Real-Time Systems. He is a fellow of the Indian National Academy of Engineering.

Prof. Michael Butler is a Professor of Computer Science at Southampton where he leads the ESS Group. He is internationally recognized as a leading expert in refinement-based formal methods. His research work encompasses applications, tools and methodology for formal methods, especially refinement based method such as B and Event-B.

Dr. Manoranjan Satpathy is an Associate Professor of Computer Science at Indian Institute of Technology, Bhubaneswar. His research interests are Formal Modelling, and Testing/ verification of software systems.

Dr. Swarup Mohalik is a Principal Engineer in Ericsson Research, Bangalore. He has over 16+ years of experience in industrial research. He has a PhD in Computer science from the Institute of Mathematical Sciences, Chennai. Earlier, he has also worked at Intel, General Motors and Hewlett-Packard. His expertise is in the theory of automata, logic and formal methods.