E3258 Jan 2:1

Design For Internet Of Things

Instructor

T.V.Prabhakar
Email: tvprabs@iisc.ac.in

Teaching Assistant

Nagakrishna Varati
Email: vnkrishna@iisc.ac.in

Department: DESE

Course Time: Mon, Wed 9:00 - 10:00 AM

Lecture venue: DESE Auditorium, Lecture Hall

Detailed Course Page:

Announcements

Brief description of the course

The course objective is make the student design a complete system to suit a use case application. In view of this, the student is expected to choose several components from a list. The components include Processor, Communication protocol, Communication technology, Power supply and Powering, Sensor interfacing, sampling, MAC layer, security of sensor nodes, etc

Prerequisites

Embedded Systems, Microcontroller basics, Processor basics, Communication basics,

Syllabus

Embedded Systems: Rise of embedded systems and their transition to intelligent systems and to Internet of Things - RFIDs, NFC, Web of Things - Network of interconnected and collaborating objects, Embedded systems architecture: Key hardware and software elements. Low power and very low power embedded systems, peripherals and sensors in embedded systems, peripheral interfacing - SPI and I2C, Hardware and software protocol stacks - MAC, Routing and application layers, performance considerations. Embedded Systems Design: Partitioning to hardware and software; principles of co-design; performance of these systems

- estimation of speed, throughput, energy harvesting and power management algorithms; hardware design elements - design, validation, and testing tools; software platforms â€“ OS and applications, code optimization, validation and robust code generation; system integration, debugging and test methodology; tools for coding, debugging, optimization, and documentation; measurement of system performance, Linux distributions for embedded systems using tools from Yocto project; Applications: Healthcare, autonomous vehicles, automation example

Course outcomes

Able to choose a processor, design a power supply, choose the powering modality, choose the communication protocol, choose communication technology, choose between sensors, ICs and components.

In summary ability to build complete (hardware and software) embedded devices.

Grading policy

10% for Lab tutorials, 10% 1st Test, 30% for Mini Project, 10% Final Project presentations and demonstrations, 40% for Final exam

Assignments

Lab assignments - Energy harvesting technologies, Linear and Switching regulators, working with Inertial Measurement Units, RFID tags, LiDARs,

Final project weekly assignments

Resources

ARM embedded Systems, Design of Internet of things (Oreilly), TI, NXP, ARM, STMicro, Maxim, Richtek data sheets and specifications, TI application notes, Reference designs etc.