INTRODUCTION TO EMBEDDED SYSTEM DESIGN

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PRE-REQUISITES: Anyone with understanding of basic electronic components and circuits, digital electronics and C programming.

INTENDED AUDIENCE: Undergraduate students in engineering and science.

INDUSTRIES APPLICABLE TO: Supported by Texas Instruments.

COURSE OUTLINE:
Embedded Systems surround us in the form of gadgets and devices that we use. There is no aspect of human lives, which is untouched by such devices at home or for health diagnostics, transportation, entertainment. Learning out Embedded Systems will give the skills to design and manufacture embedded system products of the future which will help participants towards better employability. This course teaches embedded system design using a building block approach, which allows one to visualize the requirement of an embedded system and then to design it efficiently. The course will teach embedded system design using a microcontroller, namely Texas Instruments MSP430 low power microcontroller. The course will introduce various interfacing techniques for popular input devices including sensors, output devices and communication protocols. It will teach power supply design for embedded applications. It will also teach effective embedded programming techniques in C and how to maintain code using GIT. It will have a significant practical component, which will be achieved through any available MSP430 microcontroller kit.

ABOUT INSTRUCTOR:
Prof. Dhananjay V. Gadre (New Delhi, India) completed his M.Engr. (Computer Engineering) from the University of Idaho, USA after his M.Sc. (Electronic Science) from the University of Delhi. Professor Gadre teaches at the Netaji Subhas University of Technology (formerly Netaji Subhas Institute of Technology) in the Division of Electronics and Communication Engineering, currently as an Associate Professor. At NSUT, he established two open access laboratories, namely Centre for Electronics Design and Technology (CEDT) and Texas Instruments Centre for Embedded Product Design (TI-CEPD).

CEDT started functioning at NSUT (NSIT at the time) under his guidance in 2003 and till date it has trained more than 5000 students in various activities related to hands-on electronics and system design. TI-CEPD started as a result of an MOU between Texas Instruments India and NSIT in 2012, under his direction. At TI-CEPD, he has been organizing month long, hands-on "Internship Workshops on Embedded System Design" for undergraduate and postgraduate engineering and science students, PhD scholars and young faculty since June 2013 and till date 12 such events have been organized benefiting more than 500 participants.

Activities in these two labs have resulted in many projects, products, and publications including books as well as mentoring of a few startups and providing help and guidance to science related NGOs. Since January 2018, he has been nominated as an editor of IETE Journal of Education. Also in 2018, he received an invitation to be an adjunct faculty at IIT Jammu.

Since 2016 he has been mentoring schools to acquire an 'Atal Tinkering Laboratory' under a Niti Aayog scheme of the Government of India and to help the selected schools run these laboratories efficiently.

In his professional career of more than 30 years, he taught at the SGTB Khalsa College, University of Delhi followed by a stint as a scientific officer at the Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune, designing instrumentation for use in astronomy. He has lectured and demonstrated his work extensively across the length and breadth of India and five continents, including at the World Economic Forum at Davos in Switzerland on topics related to electronics and embedded systems.
Professor Gadre is the author of several professional articles and six books. One of his books has been translated into Chinese and another one into Greek. His recent book “TinyAVR Microcontroller Projects for the Evil Genius”, published by McGraw Hill International (New York) consists of more than 30 hands-on projects and has been translated into Chinese and Russian. His latest book on TIVA ARM Cortex M4 microcontrollers published by Springer Nature is just hot off the press!

His professional interests include scientific instrumentation, digital systems design and computer architecture, embedded systems and Internet of Things. He is a licensed radio amateur with a call sign VU2NOX since 1986 and hopes to design, build and launch an amateur radio satellite in the near future.

Prof. Badri N Subudhi received M.Tech. in Electronics and System Communication from National Institute of Technology, Rourkela, India, in 2008-09. He worked for his PhD from Machine Intelligence Unit, Indian Statistical Institute, Kolkata, India in year 2014 (degree from Jadavpur University). Currently he is serving as an Assistant Professor at Indian Institute of Technology Jammu, India. Prior to this he was working as an Assistant Professor at NIT Goa from July 2014 to March 2017. He received CSIR senior research fellowship for the year 2011-2015. He was nominated as the Young Scientist Awardee by Indian Science Congress Association for the year 2012-2013. He was awarded with Young Scientist Travel grant award from DST, Government of India and Council of Scientific and Industrial Research, India in the year 2011. He is the receipient of Bose-Ramagnosi Award for the year 2010 from DST, Government of India under India-Trento Programme for Advanced Research (ITPAR). He was a visiting scientist at University of Trento, Italy during Aug. 2010 to Feb 2011. His research interests include Video Processing, Image Processing, Medical Image Processing, Machine Learning, Pattern Recognition, and Remote Sensing Image Analysis.

COURSE PLAN:


Week 8: MSP430 Clock and Reset System. MSP430 Clock sources and distribution. Types of Reset sources. Handling Interrupts in MSP430. Writing efficient Interrupt Service Routine (ISR).

