Embedded Systems: Introduction to ARM Cortex-M Microcontrollers (Introduction to Armxae Cortexu2122-M Microcontrollers)

By Jonathan Valvano

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Embedded systems are a ubiquitous component of our everyday lives. We interact with hundreds of tiny computers every day that are embedded into our houses, our cars, our toys, and our work. As our world has become more complex, so have the capabilities of the microcontrollers embedded into our devices. The ARM Cortex-M family represents a new class of microcontrollers much more powerful than the devices available ten years ago. The purpose of this book is to present the design methodology to train young engineers to understand the basic building blocks that comprise devices like a cell phone, an MP3 player, a pacemaker, antilock brakes, and an engine controller.

This book, now in its 5th edition, is the first in a series of three books that teach the fundamentals of embedded systems as applied to the ARM Cortex-M family of microcontrollers. This first book is an introduction to computers and interfacing focusing on assembly language and C programming. The second book Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers focuses on hardware/software interfacing and the design of embedded systems. The third book Embedded Systems: Real-Time Operating Systems for ARM Cortex-M Microcontrollers is an advanced book focusing on operating systems, high-speed interfacing, control systems, and robotics. The third volume could also be used for professionals wishing to design or deploy a real-time operating system onto an ARM platform. This first book is an introductory book that could be used at the college level with little or no prerequisites.

An embedded system is a system that performs a specific task and has a computer embedded inside. A system is comprised of components and interfaces connected together for a common purpose. This book is an introduction to embedded systems. Specific topics include microcontrollers, fixed-point numbers, the design of software in assembly language and C, elementary data structures, programming input/output including interrupts, analog to digital conversion, digital to analog conversion.

The book will cover embedded systems for ARM Cortex-M microcontrollers with specific details on the TM4C123, and TM4C1294. Most of the topics can be

run on any of these microcontrollers. Although the solutions are specific for the TM4C family, it will be possible to use these books for other ARM derivatives. The true engineering experience occurs not with your eyes and ears, but rather with your fingers and elbows. In other words, engineering education does not happen by listening in class or reading a book; rather it happens by designing under the watchful eyes of a patient mentor. So, go build something today, then show it to someone you respect!

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Editorial Review

About the Author
Jonathan Valvano has been teaching microcontrollers and embedded systems at the University of Texas at Austin for 35 years. He has written eight college textbooks. His textbooks on have been widely used around the world, with a total sales of over 20,000 books. He earned his BS and MS from MIT in 1977 in the fields of Computer Science and Electrical Engineering. In 1981, he received his PhD from Harvard-MIT in the field of biomedical engineering. He has over 100 journal papers, 9 book chapters and 10 patents in the medical device research area. He is a cofounder of a successful medical device company, specializing in miniature and low-power cardiac measurements. The reason he has received numerous teaching awards at the University of Texas is because he and his students share a common interest at the very core of the education process: the students' own success. Together with Professor Yerraballi he has produced two widely successful MOOCs on edX. "It is difficult to find a professor that tries harder to educate and inspire his students than Professor Valvano" - Robin Tsang. Valvano lives by this motto, "There are three steps to immortality: acknowledge your limitations, ask for forgiveness, and then do something special today to make the world a better place."

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Alice Hill:

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