Embedded systems have become increasingly popular in the last two decades thanks to the technological progress made by microelectronics manufacturers and designers, which has aimed to increase computing power and decrease the size of the logic of microprocessors and peripherals.

Designing, implementing, and integrating the software components for these systems requires a direct approach to the hardware functionalities in most cases, where tasks are implemented in a single thread and there is no operating system to provide abstractions to access CPU features and external peripherals. For this reason, embedded development is considered a domain on its own in the universe of software development, in which the developer’s approach and workflow need to be adapted accordingly.

This book briefly explains the hardware architecture of a typical embedded system, introduces the tools and methodologies needed to get started with the development of a target architecture, and then guides the readers through interaction with the system features and peripheral interaction. Some areas, such as energy efficiency and connectivity, are addressed in more detail to give a closer view of the techniques used to design low-power and connected systems. Later in the book, a more complex design, incorporating a (simplified) real-time operating system, is built from the bottom up, starting from the implementation of single system components. Finally, in this second edition, we have added a detailed analysis of the implementation of TrustZone-M, the TEE technology introduced by ARM as part of its latest family of embedded microcontrollers.

The discussion often focuses on specific security and safety mechanisms by suggesting specific technologies aimed at improving the robustness of the system against programming errors in the application code, or even malicious attempts to compromise its integrity