

# Preface

Rising development of computer-based applications in almost all fields, from medicine up to spacecraft technology, opened needs for new specialists—embedded engineers. Embedded engineering covers different application fields solving needed functionality by embedded computer technology. Therefore, the main challenges in embedded engineering education are interdisciplinary approach and fast development of computer technology with variety of customized processor platforms.

Some aspects of embedded engineering education have been the subject of the European research project “FP7-ICT-2011-8/317882: Embedded Engineering Learning Platform.” The five achieved outcomes—unified platform, basic set of exercises, augmented reality interface, remote laboratory, and evaluation methodology with tools—can be a valuable contribution for the establishment of an embedded engineering profile.

This book is initiated by few universities from different countries which try to establish an attractive and efficient study program for embedded engineering. Besides results and experiences from the research project, it also includes some other relevant experiences and expertise.

The book contains 12 original contributions.

The first one is discussing potential answers to the main challenges of embedded engineering education. Some appropriate approaches for the definition of study programs and their evaluation are given, together with early experiences at the university where this approach is applied in last five years.

The second chapter presents a unified learning platform for embedded engineering which includes hardware and software modules necessary for laboratory exercises during the whole curriculum. The main goal is significant reduction of introduction overheads in different courses. The platform has been evaluated at four universities.

The next chapter gives a comprehensive overview of the basic set of 65 exercises which accompany the unified learning platform. Besides documentation for each exercise, necessary support and check routines are included.

The fourth chapter gives an educational approach regarding advanced computer architectures. Implemented Cray-1 architecture on the unified learning platform allows students to learn, through exercises, the historical development of multicore systems and supercomputers.

The fifth chapter presents new improvement concepts in education using augmented reality technology. Use scenarios, field studies, activity analysis, and formative evaluations are presented.

The sixth chapter presents development and usage advances of an augmented reality interface for the unified learning platform. This interface is designed as the learning assistance module providing students an easy and broad access to additional information during the laboratory exercises.

The seventh chapter proposes a very useful remote laboratory concept based on the usage of the unified platform. Necessary hardware and software modules are described, and different usage scenarios are evaluated.

The eighth chapter gives examples of advanced projects on the unified learning platform evaluating their impact on embedded engineering education. Besides standard laboratory exercises, the advanced student projects provide the best way to familiarize students with interdisciplinary embedded applications.

The ninth chapter gives a useful overview of experiences at the university where the remote laboratory has been used in running study programs. Additionally, the given evaluation provides very important guidelines for further usage of the remote laboratory on the unified platform.

The tenth chapter proposes adequate evaluation methods and tools for embedded engineering education. Particularly, exploring aspects of self-regulated learning is important for higher study efficiency.

The eleventh chapter addresses a very important aspect of student motivation. The proposed approach is based on specially designed introductory projects in electrical and computer engineering. This approach is illustrated through an example—team project for planning a window-cleaning robot.

The last chapter is focused on interfacing in intelligent sensor networks. Analyzing different solutions, a new concept has been proposed where recognizing task intelligence is suited on sensor.

The editors hope that this book will open a broader discussion about necessary knowledge and appropriate learning methods for the new profile of embedded engineers.

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