PARASOFT

Pforzheim University Relies on Automated Software Testing Solution for Computer Engineering Program

REDUCE

Manual Effort to Standards Compliance

REDUCE

Bug Fix Cost

IMPROVE

Code Quality

OVERVIEW

Microelectronics is ubiquitous today in smartphones, Industry 4.0, satellite-based applications, and more. Modern microelectronic systems are based on the interaction of hardware and software. This interface is the working area of graduates of computer science and engineering.

At Pforzheim University, School of Engineering, the Computer Engineering study program, explains basic principles of mathematics, physics, and electrical engineering. It enables a sound training in computer sciences and digital technology since a comprehensive knowledge of software and hardware is essential for the development of modern computer systems.

Extensive knowledge of microcontrollers and electronics perfectly completes the study. Based on the fact that today's technical systems are characterized by a high degree of complexity, the emphasis is placed on interdisciplinary knowledge and project work.

The increasing digitalization in vertical markets turns software engineering more and more into a key discipline of the future. As part of the Computer Engineering degree program, students at Pforzheim University (HS PF) deal with this content over two semesters in lectures and practical laboratory exercises.

The study program lasts a total of seven semesters. On the agenda in the third semester, the design steps up to building and integrating the software. The implementation takes place in the C++ language.

Prior to the practical semester in industry during the fifth semester, the focus in the fourth semester is set on software testing. The curriculum includes the essential concepts and activities of modern software development, especially testing. Software testing determines whether the functionality of the application meets the requirements and can be implemented. In addition, testing identifies defects that can be fixed immediately so that the product or application functions error-free when it's delivered.

Software testing can be done manually or automatically, and there are many methods to choose from. The Software Engineering program is based on the curriculum of the ISTQB (International Software Testing Qualification Board).

ARMORED FOR THE FUTURE WITH PARASOFT C/C++TEST

Since a meeting in person at the Embedded World trade fair in 2014, HS Pforzheim has been using the Parasoft C/C++test software testing tool. The initial server installation with licenses for 20 students was completely unproblematic, thanks to Parasoft's dedicated support.

The features of the test tool include:

» Report generation

» Pre-configured tests

» Test generation

» Integration in toolchain (Eclipse)

With this software development testing solution, students can comprehensively test their C and C++ applications with leading industry standards, including MISRA, AUTOSAR, and CERT.

> *"Pforzheim University greatly appreciates the easy and cooperative partnership with Parasoft."*
>
> —Prof. Dr. Martin Pfeiffer, Software Engineering 2 at
>   Pforzheim University

Many vertical industries such as automotive, aerospace, railway, medical, industrial, among others, use the programming rules and guidelines defined by these standards to help produce robust code that must function safely, securely, and reliably.

What makes it special is this: students work with real tools that are in industry use, thereby learning software development best practices. Even if many opportunities cannot be exploited due to the limited time available, this close link between theory and practice creates positive synergy effects for later career entry—one of the advantages of Pforzheim University.

THE PRACTICAL PROCEDURE

Students receive the installation for a virtual machine that integrates the Parasoft tools. Because it can also be used on private computers, students are not tied to a specific infrastructure. Another advantage of using the virtual machines is the ability to work from home or independently of the university's infrastructure, excluding license servers, of course.

The first stage of learning introduces students to the C/C++test tool. They can carry out static tests and make code improvements. Regression testing follows to ensure no static code violations remain.

Next, students design, implement, and carry out simple unit tests including equivalence class partitioning and boundary value testing. Then, they examine various code implementation aspects. One aspect is code complexity and another is effort estimation. When combined with other design aspects, these become the basis for a critical discussion of the present code base quality. Later, students revise testing from the point of view of code testability, among other things, and tests are adapted accordingly.

To prove that the new code design is more economical, students generate a new effort estimate and a new cost estimate.

There's also an introduction to state-based testing, which is a method for testing object-oriented programs. Students create approaches for a corresponding test design in preparation for the last laboratory appointment.

In the lab itself, students work together to create the most suitable tests. At the same time, they review the knowledge that they gained and make notes of relevant points to revise and improve the tests. In the final discussion, the students share their learnings with each other and collaborate to further deepen their knowledge.

EVALUATION

Currently, Parasoft C/C++test is the industry's most comprehensive software development testing solution for testing safety-critical code in C/C++ language. By requiring organizations to use a single tool for development testing best practices, security and safety compliance, and conformance documentation and reporting, it greatly reduces the manual workload for compliance with programming standards. Using AI and machine learning, it reduces the burden on teams and ensures that serious design issues are fixed first, when it's most cost-effective to do so.

Students can use Parasoft C/C++test to get an automated personalized critique of their code when and as often as they require. If their code fails a test, they can access and view a detailed explanation of why it failed and how to fix it—all with one click.

Also important to the training is that the errors are not automatically fixed so students are forced to understand the reasons for each programming error. This is how they learn error-free coding for the real working world.

Another interesting learning aspect is the skill of time management. During the course, participants learn to weigh the time spent on improving code quality against the time spent on adding additional functionality. This raises awareness of professional software developers that time is money and to use their time effectively.

MISSION ACCOMPLISHED

With the Software Engineering study program, Pforzheim University lays the foundation for graduates to make an effective and immediate contribution to their future workplace as qualified software developers. To this end, it educates students about the correctness of code and familiarizes them with professional tools like Parasoft C/C++test, which is widely used in industry. They learn the basic methods of testing. In addition, the tool offers many possibilities that can only be fully exploited in practical use in real life.

LEARN MORE

Find out how automating test generation empowers development teams to improve the quality, safety, and security of the software they deliver while reducing time, costs, and time to market. Download the whitepaper.

ABOUT PFORZHEIM UNIVERSITY

Pforzheim University with its three schools—the School of Design, the School of Engineering, and the Business School—enjoys a first-class reputation. The schools combine creativity with business education and technical precision. This combination also makes the university an attractive science and research partner for the regional and national economy. With around 6,200 students, Pforzheim University—founded in 1877—is one of the largest universities of applied sciences in the state of Baden-Württemberg (Germany).

The qualifications and practical experience of the teaching staff on the one hand and intensive cooperation with successful companies on the other lay the foundation for the university's outstanding position in the rankings. Pforzheim University offers 29 bachelor's and 20 master's degree programs in the schools of Design, Engineering, and Business and Law. It enjoys a high level of acceptance in research and teaching, which also results from the good supervision ratio. Around 480 professors and lecturers ensure that students feel they are in good hands in Pforzheim right from the start.

The close connection between theory and practice develops positive synergy effects that result in numerous projects and research approaches for industry and business. The Institute for Applied Research, numerous Steinbeis Transfer Centers or the Jewelry Technology Institute are just a few successful examples of this.

The university cooperates with more than 100 partner universities worldwide, is involved in international networks and attaches great importance to business and corporate ethics. The university was one of the first in the world to commit to the Principles for Responsible Management Education (PRME) initiated by the UN.

ABOUT PARASOFT

Parasoft helps organizations continuously deliver quality software with its market-proven, integrated suite of automated software testing tools. Supporting the embedded, enterprise, and IoT markets, Parasoft's technologies reduce the time, effort, and cost of delivering secure, reliable, and compliant software by integrating everything from deep code analysis and unit testing to web UI and API testing, plus service virtualization and complete code coverage, into the delivery pipeline. Bringing all this together, Parasoft's award-winning reporting and analytics dashboard delivers a centralized view of quality enabling organizations to deliver with confidence and succeed in today's most strategic ecosystems and development initiatives—security, safety-critical, Agile, DevOps, and continuous testing.