INTERVIEW: ENGINEERING COMPETENCIES VIA DISTANCE LEARNING

The team of the Distance and Independent Studies Center (DISC) talks about the distance learning programme Software Engineering for Embedded Systems with

Prof. Dr. Dr. h. c. Dieter Rombach (technical director and author of a textbook),
Dr.-Ing. Rasmus Adler (tutor and author of a textbook),
Dipl.-Päd. Eva Blum (coordinator at IESE) and
Dr. Juliane Brauch (programme manager at DISC).

DISC: Prof. Rombach, eleven years ago you started the Master’s programme Software Engineering for Embedded Systems together with the DISC, the Fraunhofer Academy and the Department of Computer Science of the Technische Universität Kaiserslautern. What were your intentions?

Rombach: In our co-operations with the industry, we recognized a dramatic change in needed engineering competencies. In development teams of companies like Daimler or Bosch the hardware vs. software competence ratio changed from 9:1 in the past to 1.9 as software took over more and more functionality. The challenge was to re-train traditional hardware engineers to work as software engineers. As this is not a trivial task – hardware engineers are used to tolerances (which does not exist in software) and do not view software defects as design defects (which is the case for software being copied in millions of products). Therefore, a distance learning Master was needed.

DISC: What should prospective students bring with them? And asked the other way round: What do the graduates take with them, i.e. what opportunities does the degree offer?

Rombach: We designed the Master to serve professionals who had at least a Bachelor degree in a technical field (mostly engineering) and at least three years of practical exposure to software development. After graduation, our students would be qualified for lead roles in engineering software for critical applications (e.g., automotive control software). In that sense, they have huge opportunities in the ever-growing market of software development.

DISC: Students learn with the help of textbooks, among other things. What kind of materials are these?
**Brauch:** The textbooks have been developed especially for the students and correspond to a quality guideline. **Rombach:** The best international experts from around the world created these textbook modules. In that sense, the distance learning Master in Kaiserslautern provides international best practice knowledge. In addition to textbook knowledge, students can address clarifying questions to experts via the online-campus and attend two onsite workshops for applying their textbook knowledge to practical problems.

**DISC:** What other learning tools does the programme offer?

**Brauch:** Our students have the opportunity to use our forums and online tutorials within the online-campus to discuss the learning content with tutors and experts in their respective fields. They also have access to the Center for Self-directed learning, which provides advice and assistance at all times if problems arise during self-learning.

**DISC:** Please, tell us more about the online-campus and the online tutorials...

**Adler:** The online-campus supports students in their self-study. Here, students can download learning materials such as textbooks and ask questions directly to their tutors in several forums. Events and other news are also communicated via the platform. In these forums, transfer resources such as additional materials or recorded online tutorials can also be uploaded. The five online tutorials, each lasting 90 minutes, mainly deal with students’ questions about the learning materials. The benefit of the tutorials lies in the fact that students can also ask questions in addition to the textbooks that are specifically relevant to their own field of work. Learning tips are also provided here.

**DISC:** In addition to the virtual learning platform, there is also an on-campus phase at the end of the semester. What can students expect here?

**Blum:** The on-campus phase takes place at the end of the first three semesters at Fraunhofer Institute for Experimental Software Engineering IESE in Kaiserslautern and offers students insights into the laboratories located there. There will be tutorials, hands-on exercises and group work. Monday to Friday, the students deal with the various contents. On Sunday, the exams will be written. Topics of the on-campus phases are UML, Requirements Engineering and Software Architecture as well as Matlab/Simulink. The on-campus phase ends with a short oral exam. A big advantage of the on-campus phase is that students can exchange ideas with scientists on site and plan their further studies or Master’s thesis in personal meetings.

**DISC:** Prof. Rombach, what is your evaluation of eleven years of *Software Engineering for Embedded Systems*?

**Rombach:** I am convinced that this distance learning Master is a very successful and internationally recognized approach to contributing to the reduction of the ever-growing gap of software engineering experts in the industry. The Master’s programme is received very well. Each year we have a high numbers of applications, and industries are eager to have strategic software engineering positions filled with our graduates.