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Carnegie Mellon University Software Engineering Program Teaches Modern Software Engineering Using Jama Connect®

Graduates enter the workforce better prepared to tackle real world engineering problems with modern technology

- Master of Science in Software Engineering (M.S.-SE) is a unique program offered exclusively at CMU's Silicon Valley campus by the Department of Electrical and Computer Engineering
- Emphasizes a rigorous foundation in the core disciplines of software engineering
- Offers students fundamental knowledge, skills, and first-hand experience in software engineering by balancing theory and practice, engaging students in active learning, and encouraging collaboration on projects drawn from real-world contexts

CUSTOMER STORY OVERVIEW

As a co-founder of the Carnegie Mellon University Software Engineering Master's Program, Dr. Cécile Péraire set out to prepare her students to enter the workforce by teaching modern software tools and processes with a hands-on approach. Prior to joining Carnegie Mellon as a professor, Péraire worked for a decade at Rational Software and then at IBM.

As part of this modern approach to software engineering, Péraire teaches her students how to use Jama Connect® as the single source of truth for software product definition and uses the platform as a way to review her student's work.

PRINCIPLES OF THE SOFTWARE ENGINEERING COURSE

As a professor of Software Engineering for master's students at Carnegie Mellon, Cécile Péraire teaches with a hands-on approach. Each semester, students are asked to select one real world challenge, and to come up with a software product that could help address the challenge. In the past, students have selected challenges like wildfires, food waste, and homelessness.

Instead of teaching a traditional lecture-based course, Péraire takes a mixed approach that combines flipped-classroom delivery and project-based learning, with students implementing dual-track Agile during their project. As the name suggests, it's a process that has two tracks of work — one track aims at discovering what functionality to build next, focusing on requirements engineering and interaction design, and the other track focuses on delivering new functionality. The two tracks run continuously and in parallel with a strong focus on understanding the needs of the stakeholders and validating that the team is building the right product from the technical perspective, the user perspective, and the business perspective.

"In order to ensure that my students are building the right product, they must remain in close contact with the stakeholders during the entire semester and welcome changes at any time, which is a key Agile principle," said Péraire.

Prior to Péraire joining CMU, the requirements engineering course was taught in a more traditional and outdated fashion.

"When I joined CMU, I inherited a requirements engineering course that was taught using Word and Excel. I've always tried to teach fairly lightweight processes but having to create and structure documents introduced a lot of overhead for the students and made the process quite heavy and old fashioned," said Péraire. "I could immediately see that it wasn't working. When I had a chance to create my own course, I decided to do it differently."

When Péraire set out to find a requirements management solution for her requirements engineering and interaction design course, she had a set of very specific criteria.

The new solution must have the following characteristics:

- Cloud-based
- Robust requirements management capabilities
- Customizable to support all development practices
- Reliable – free from bugs and crashes
- User-friendly interface that is easy to learn
- Resources and e-learning for students
- Responsive and helpful support team and account management

After evaluating all available solutions, Péraire determined that Jama Connect stood out as the leader and fit her needs the best.

"After reading many reviews about the leading requirements management solutions, I ended up with a short list of about five tools that I evaluated very thoroughly. Overall, Jama Connect was the one that performed the best and met all of the criteria on my list," said Péraire.

Now, with Jama Connect deeply ingrained in her software engineering course, students use the platform as their single source of truth for all software product definition activities.

Using Jama Connect for software product definition has been key to supporting her students in order to build the right product for their stakeholders. They use Jama Connect as a hub for all the artifacts that are created during the project, "…from interview notes to storyboards, prototypes, user stories, all the way down to working software. Every artifact that relates to the project is available in or accessible from Jama Connect. It's the hub for all of the information we need," said Péraire.

"My students use Jama Connect first to structure the information effectively, and then to share the information within their teams and with other stakeholders. They are required to stay in contact with their stakeholders throughout the semester and Jama Connect helps to facilitate that communication when they aren't able to meet in person. Remote communication can happen synchronously or asynchronously as Jama Connect supports all those different ways of sharing information and getting feedback on the work done," said Péraire.

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> **CÉCILE PÉRAIRE**
> Professor of Software Engineering
> Carnegie Mellon

In addition to using Jama Connect to help students learn how to properly organize software development projects' artifacts, Péraire also uses the platform to review, grade, and give feedback on her students' work.

Improved Review Processes

"I use Jama Connect Review Center to grade and provide feedback on all deliverables. The process in itself is a learning experience for students because it actually mimics the real-world industry review. It provides me with the ability to very easily comment on any element of the project, ask questions, request changes, or have discussions related to a specific section of a deliverable," said Péraire.

Enhanced Visibility into Revision History

"Jama Connect gives me visibility into the students' work. At any point I can log into Jama Connect and see what is going on, who is doing what, and I can see the different discussion streams. I can see the revision history and who is contributing to what. Compared to Word and Excel, this gives me an improved ability to evaluate students individually while letting them work in teams," said Péraire.

Effective Collaboration

"With Jama Connect, I not only have improved visibility into the students' work, but I have the ability to effectively collaborate with students outside of the classroom for both mentoring and evaluation purposes. We can have a conversation around any project item," said Péraire.

Because Péraire's courses are hands-on and not lecture based, her students learn by doing. By taking a project-based approach to learning, she's able to mimic what happens in the industry and her students get firsthand experience working through those challenges and interacting with stakeholders.

"Software product definition is a highly creative process supported by a combination of interactive design and requirements engineering practices. As students learn to apply those practices on their products during the course project, they document the outcome of their work in Jama Connect." said Péraire.

"Jama Connect is really an effective way of teaching by example. The platform is fully customizable, so I created a structure for the students that nicely supports software product definition in the context of course projects. Students can use that as a good example of how to structure and share information in the future. That can be used as a starting point for a project and be customized to adapt to a different context," said Péraire.

With Jama Connect, Péraire shares that her students can focus on content creation instead of building a complex document structure, which results in better learning outcomes and increased student productivity. Even if a student graduates and goes on to work at an organization that chooses not to use a requirements management platform like Jama Connect, Péraire believes her students are still more prepared to enter the workforce than those taught traditional, outdated software engineering tools and processes.

 "Learning with Jama Connect gives my students a model of how to organize and structure artifacts related to software product definition. Even if they do not have a requirements management tool and have to go back to Word and Excel on their next project, they will have a good idea about how to organize and structure the information. While in that case they would lose the power of the tool, being exposed to an effective way of working should benefit my students greatly," said Péraire

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> Professor of Software Engineering, Carnegie Mellon

The Software Engineering Institute (SEI) at Carnegie Mellon University is the birthplace of the Capability Maturity Model Integration (CMMI), a framework used to evaluate the maturity of an organization's software development process. The model describes a five-level evolutionary path of increasingly organized and systematically more mature processes.

Worldwide CMMI plays a key role in software development organizations that must showcase their development maturity. Teams are working hard to move their current CMM level to the next level and hence demonstrate their ability to deliver quality software.

Being CMMI certified is a common requirement for the Department of Defense (DoD) and U.S. Government software development contracts.

"While I am not a CMMI expert, my understanding is that during a CMMI appraisal, the organization must show evidence of implementation for each practice in the scope of the appraisal. For organizations that have a good process in place, Jama Connect can make this process visible. This can be beneficial during the CMMI appraisal in order to quickly identify evidence that the required practices are being implemented by the organization. Jama Connect can be leveraged to support demonstrating the alignment between CMMI and the practices adopted by the organizations needing certification," said Péraire.

As her students look toward graduating and entering the workforce, Péraire believes organizations will have an easier time attracting engineering talent if they are using modern technology and processes.

"In my opinion, students will want to work in organizations that use modern technologies and practices instead of outdated ones," said Péraire.

As important as having the right platform in place is, it's equally important to work with a solution provider that can help your team build an effective and efficient process around software engineering.

"Introducing a tool isn't going to fix a broken process. But if you have a good process in place, a customizable platform like Jama Connect has many benefits. It makes your process and your knowledge visible. It enables changes and communication within the team and with stakeholders. It reduces the overhead and maintenance. It helps teams avoid duplication of information and inconsistency. Overall, it improves your effectiveness and efficiency. Even though a tool won't solve all of your problems, if used correctly, Jama Connect will make your team more productive in the long run."

Péraire plans to continue using Jama Connect to teach software engineering in practice, showing students firsthand how modern companies are developing complex software products.

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Jama Software® is focused on maximizing innovation success in multidisciplinary engineering organizations. Numerous firsts for humanity in fields such as fuel cells, electrification, space, software-defined vehicles, surgical robotics, and more all rely on Jama Connect® requirements management software to minimize the risk of defects, rework, cost overruns, and recalls. Using Jama Connect, engineering organizations can now intelligently manage the development process by leveraging Live Traceability™ across best-of-breed tools to measurably improve outcomes. Our rapidly growing customer base spans the automotive, medical device, life sciences, semiconductor, aerospace & defense, industrial manufacturing, consumer electronics, financial services, and insurance industries. To learn more, please visit us at jamasoftware.com.