
Advanced Software Engineering - Syllabus

University of Pisa¹ - a.y. 2022/2023

Software Products The product vision. Software product management. Product prototyping.	ch. 1 of [1], slides ²
Agile Software Engineering Agile methods. Extreme Programming. Scrum.	ch. 2 of [1], slides
Features, Scenarios, and Stories Personas. Scenarios. User stories. Feature identification.	ch. 3 of [1], slides
Software Architecture Importance of architecture. Architectural design. System decomposition. Distribution architecture. Technology issues. Enterprise Integration Patterns.	ch. 4 of [1], [2], slides
Cloud-based Software Virtualization, containers, Docker and Docker Compose. Cloud service models. Software as a Service. Multi-tenant and multi-instance systems. Cloud software architecture. Kubernetes.	ch. 5 of [1], [3], slides
Microservices Architecture Microservices, microservices architecture. RESTful services. Microservice deployment. Architectural smells and refactorings.	ch. 6 of [1], [4] slides
Security Attacks and defenses. Authentication. Authorization. Encryption. Privacy. Challenges of securing microservices. Smells and refactorings for microservices security.	ch. 7 of [1], slides
DevOps DevOps principles, Continuous Integration, Continuous Delivery and Deployment, Infrastructure as Code, DevOps measurement.	ch. 10 of [1], slides
Business Process Modelling Business process models, BPMN, workflow nets.	sect. 5 of [5], [6], slides
Testing Functional testing, test automation, test-driven development, security testing, code reviews.	ch. 9 of [1], slides

References

- [1] Ian Sommerville. [Engineering Software Products - An Introduction to Modern Software Engineering](#). Pearson, 2021. ³
- [2] The Apache Software Foundation. [Enterprise Integration Patterns](#). 2022.
- [3] Jeremy Jordan. [An introduction to Kubernetes](#). 2019.
- [4] D. Neri, J. Soldani, O. Zimmermann, A. Brogi. [Design principles, architectural smells and refactorings for microservices: A multivocal review](#). SICS Software-Intensive Cyber-Physical Systems, 2020.
- [5] OMG. [BPMN 2.0 by example](#). 2010.
- [6] A. Brogi, S. Forti. Workflow nets. [Teaching note](#). 2022.

¹ Course offered for the MSc in Computer Science and Networking, for the MSc in Computer Science and for the MSc in Cybersecurity.

² All the slides used in the course are available in the Moodle page of the course.

³ Two copies of the book will be available in [UNIPi computer science library](#).