The specialization Software Engineering

- Prof. Dr.-Ing. Peter Liggesmeyer *: Software Engineering: Dependability
- Prof. Dr. Ralf Hinze, Programming Languages
- Prof. Dr. Arnd Poetzsch-Heffter**/Dr. Annette Bieniusa: Software Technology
- Prof. Dr. Jörg Dörr ***: Digital Farming
- Many lecturers from Fraunhofer IESE

* Executive and scientific director of Fraunhofer IESE
** President at TUK
*** Extended Institute Management of Fraunhofer IESE
Why Software Engineering?

☐ Software Engineering provides many facets => Techniques, methods, processes, management

☐ Software Engineering influences every domain (e.g., banking, insurance companies, automotive, aerospace, medical, automation, ....)

☐ Software Engineering is a discipline in computer science, that always needed more workforce than available (more open positions than applicants)

☐ Software Engineering is international

☐ The market for Software Engineers ist still growing => good career opportunities
Future systems: Smart Ecosystems

IS
Information Systems

Emergent Software
(IS-Driven)

MS
Mobile Systems

SMART Ecosystems

ES
Embedded Systems

Cyber-Physical Systems
(ES-Driven)

Data Analytics

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Software has to have specific properties (e.g., safety, availability) => Quality assurance:

**Software Engineering: Dependability**

Definition and processing of software => Models, techniques and tools:

**Software Technology**

Writing software requires appropriate programming languages =>

**Programming Languages**

Software and Systems engineering in application domains =>

**Digital Farming**
Software Engineering: Dependability (Prof. Liggesmeyer)

- Dependability: safety, security, reliability, availability
- Systems engineering of dependable embedded systems
- Model-based safety and reliability analysis
- Dynamic risk assessment and safety assurance under uncertainty

Our topic: Development, quality assurance and risk reduction for safety-critical systems
Software Technology
(Prof. Poetzsch-Heffter / Dr. Annette Bieniusa)

Research topics

- **Systems programming**
  - Distributed and concurrent programming techniques
  - Component models and their integration

- **Modeling and generation of software**
  - Software modeling on higher abstraction levels
  - Domain specific models
  - Generation of efficient code based on models

- **Specification and verification** of software properties
  - Specification and verification languages and tools
  - Dynamic property checking
Research topics

• Functional and generic programming
• Semantics of programming languages, Category theory
• Systematic algorithm design (Algebra of Programming)
• Persistent data structures

Our long-term goal is to develop theory, languages, and tools that simplify the construction of reliable software systems.
Digital Farming
(Prof. Dörr)

Focus: Software and Systems engineering for Digital Farming

Digitalization in agriculture: a highly relevant, current field of research, with exciting research challenges

Research topics:
- Interoperability of digital solutions in agriculture
- Requirements Engineering, User Acceptance and User Experience
- Modeling of the complete digital ecosystem, individual systems and system variants

Farbot lab in building 32, 4th floor for future digital farming project
The specialization Software Engineering
Prof. Dr.-Ing. Liggesmeyer, Prof. Dr. Poetzsch-Heffter, Prof. Dr. Hinze, Dr. Bieniusa, Prof. Dr. Jörg Dörr and Lecturers from Fraunhofer IESE

<table>
<thead>
<tr>
<th>Software Engineering: Dependability (seda)</th>
<th>Fraunhofer IESE</th>
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<tbody>
<tr>
<td><strong>Prof. Dr. Liggesmeyer</strong></td>
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**Kontakt:** C. Frey, frey@informatik.uni-kl.de, http://seda.cs.uni-kl.de

- Modellierung, B, 2V+1Ü, SS (D), Liggesmeyer
- Foundations of Software Engineering (FSE), B/M, 2V+1Ü, SS (E), Lig.
- Safety and Reliability of Embedded Systems (SRES), B/M, 2V+1Ü, WS (E), Liggesmeyer
- Quality Management and Quality Assurance (QMQA), M, 2V+1Ü, WS (E), Liggesmeyer

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<th>Programming Languages (AGPL) / Software Technology (softtech)</th>
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<td><strong>Prof. Dr. Hinze / Prof. Dr. Poetzsch-Heffter / Dr. Annette Bieniusa</strong></td>
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**Kontakt:** J. Stengel, stengel@informatik.uni-kl.de, https://pl.cs.uni-kl.de

- Grundlagen der Programmierung, B, 4V+4Ü, WS (D), Hinze
- Programmierpraktikum, B, 2P, SS (D), Hinze
- Training für Programmierwettbewerbe, B, 2S, SS(D) unregelmäßig, Bieniusa
- Funktionale Programmierung, M, 4V+2Ü, SS (D, ggf. E), Hinze
- Compiler and Language Processing Tools, 3V + 3Ü, WS (E), Bieniusa
- Programming Distributed Systems, 3V+3Ü, SS (E), Bieniusa
- Replication and Consistency, 2V+1S, WS (E), Bieniusa
- Programmieren in C, B(Hörer anderer FBs), 2V+2Ü, SS (D), Bieniusa

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**Kontakt:** C. Frey, frey@informatik.uni-kl.de, http://seda.cs.uni-kl.de

- Requirements Engineering, M(Inform.), B(SozioInform.), 2V+1Ü, WS (E), Dörr
- Projekt Agile Methoden, B(SozioInform.), 2P, SS (D), Dörr
- Foundations of Digital Farming, M(Inform.), 2V+1Ü, SS (E), Dörr

**Common offers**

- Projekt, B/M, 4P, WS/SS (D/E), all
- Bachelor-/Masterseminar, B/M, 2S, WS/SS (D/E), all
- Bachelor-/Masterarbeiten, B/M, (D/E), all

**Title**
- M: Master (program), B. Bachelor (program)
- Winter / Summer
- Hours per week

**Language**
- Lecturer

**Requirements Engineering, M(Inform.), B(SozioInform.), 2V+1Ü, WS (E), Dörr**