TECHNISCHE UNIVERSITÄT DRESDEN

Fakultät Informatik, Institut für Software- und Multimediatechnik, Lehrstuhl für Softwaretechnologie

Softwaretechnologie II

Dr.-Ing. Sebastian Götz
Technische Universität Dresden
Institut für Software- und Multimediatechnik
Gruppe Softwaretechnologie
http://st.inf.tu-dresden.de/teaching/swt2
WS 17/18, 04.10.2017

Vorlesungen und Übungen

- **Vorlesung: Mi 11:10 E023**

- **Vorlesung ist empfohlen für Jahr 3 (Bachelor und Diplom)**
  - Es werden wichtige Grundlagen für weitere Kurse eingeführt
- **Wichtigste Informationsquelle:**
  - http://st.inf.tu-dresden.de/teaching/swt2
  - http://st.inf.tu-dresden.de/ -> Teaching -> Softwaretechnologie II
- **Übungsleiter: Peter Heisig**
  - Übungen können nur einen kleinen Teil der Vorlesung abdecken
  - Ab Woche 2
  - Die Einführung nächste Woche wird von Sebastian Götz durchgeführt
  - Semester ist in Komplexe aufgeteilt:
    - Petrinetze
    - Ontologien
    - Anforderungsanalyse: ZOPP, Lasten- und Pflichtenheft
    - Regressiontesten

- **Teilung der Übungsgruppen in kleine Gruppen á 4-5 Personen**
- **Zumeist 2-3 Wochen Zeit zur Bearbeitung eines Komplexes**
- **Alle Übungskomplexe sollten bearbeitet werden**
  - → Prüfung auch als 2/0/0 möglich
- **Achtung, obwohl die Vorlesung in Deutsch stattfindet, sind einige englische Folien eingestreut.**
  - Lehre auf dem Master-Niveau findet oft in Englisch statt
  - Gewöhnen Sie sich bitte ein

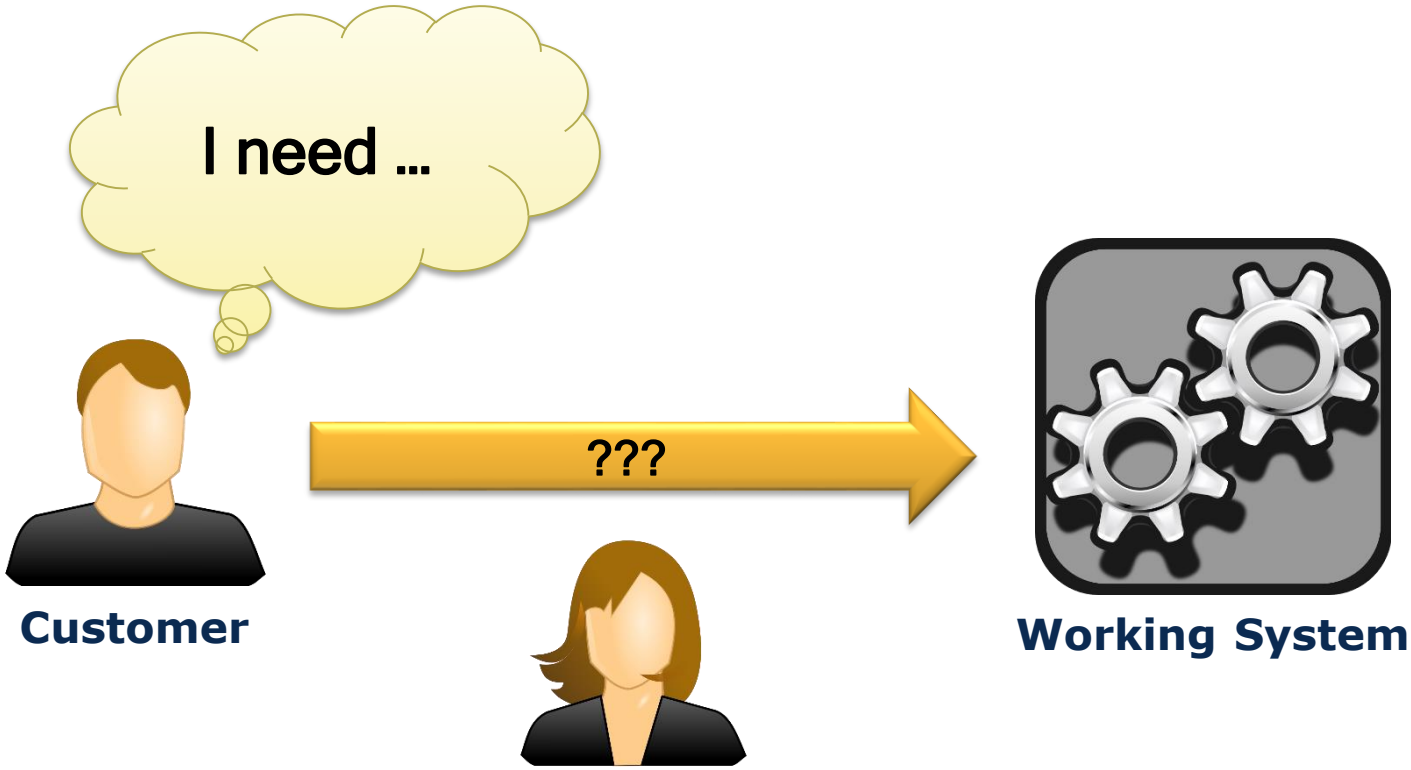
Warning: Remarks on the Nature of the Course

- **A University is unlike a high school**
  - You should not expect to get a book, and that's it
    - Software Engineering is too broad for that, unfortunately
    - The lectures have to focus on the most important things
  - You should not expect to be an expert after the course
- **Find your way from the lecture slides into the books**
  - Follow the reading instructions
  - Learn the additional material and read the additional readings
  - Follow the exercises in the groups
- **Expect to learn min. 3-4 weeks for the oral exam**
  - Don't wait until 1 week before the exam! That's too late...
- **Be aware: you have not yet seen larger systems**
  - Middle-size systems start over 100KLOC

Remarks on the Nature of the Course

- **The purpose of lecturing is**
  - To give you a condensed insight on the most important topics, such that you do not waste too much time during reading
  - To give you pointers for future work, once you left the course
    - If you haven't got the pointer, you can waste years in darkness

- **How to get from a set of informal and incomplete requirements (the customer's mind) to a working software system?**
- **Here: non-object-oriented development methods**



Main Goals

- **Learn about "forward engineering" of software**
  - Technology, process, experiences, human conditions
  - What a software engineer may sell (services, products, product lines…)
  - Modeling with big models
  - The influence of logic and graph rewriting (Because almost all requirements and design notations are graph-based)
  - Requirements engineering, testing, and software quality
  - Other design methods than Object-orientation
  - Software Product Lines
- **Learn about the behavioral language Petri Nets, and its derivatives**
  - Earning money with software (introduction to business models)
- **Get as many ideas as possible (broad overview)**
  - NOT: technical in-depth teaching (this is left to other courses)

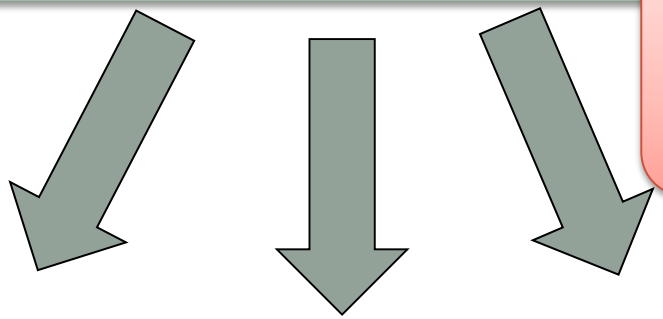
The top level of the V-model: Requirements, Validation, Software Quality

- **Know about requirement specification**
- **Software Quality:**
  - Contract-based development
  - Know what inspections are
  - Know about maintenance problems
  - Know about basic testing concepts
- **Model quality**
  - Model analysis
  - Model structuring

- **Know different forms of design methods**
  - functional, object-oriented, data-oriented
- **Know behavioral methods to generate code for verifiable specifications**
  - Petri nets
- **Get overview of software processes**
  - MDA, XP, V-model, ...
- **Know about "software architecture" and architectural styles**

Master's Courses (Hauptstudium)

Softwaretechnologie II (Bachelor)
Modellierung, Entwurfsmethoden, Produktlinien, Geschäftsmodelle (WS)



Model-Driven Software Development in Technical Spaces
How to be productive in software development (WS)
(Prof. Aßmann)

Academic Skills in Computer Science (Dr. Götz)
Wie man wissenschaftlich arbeitet (WS)

Requirements Engineering und Testen (Dr. Demuth)
Wie man Qualität für Software erzielt (WS)

Software-Management (Dr. Demuth)
Wie man Projekte macht (SS)

Design Patterns and Frameworks (Dr. Götz)
Architektur objektorientierter Systeme (WS)

Software as a Business (Prof. Aßmann)
How to develop a business model and a startup (WS)

Ausgewählte Kapitel aus der Softwaretechnik (Dr. Götz)
Softwarearchitektur (SS)

Component-Based Software Engineering (Dr. Götz)
Produktlinien mit anderen Komponentenmodellen (SS)

Future-Proof Software Systems (Dr. Furrer)
Evolvable architectures (WS)

Automotive Software Engineering (Prof. Hohlfeld)
(SS)

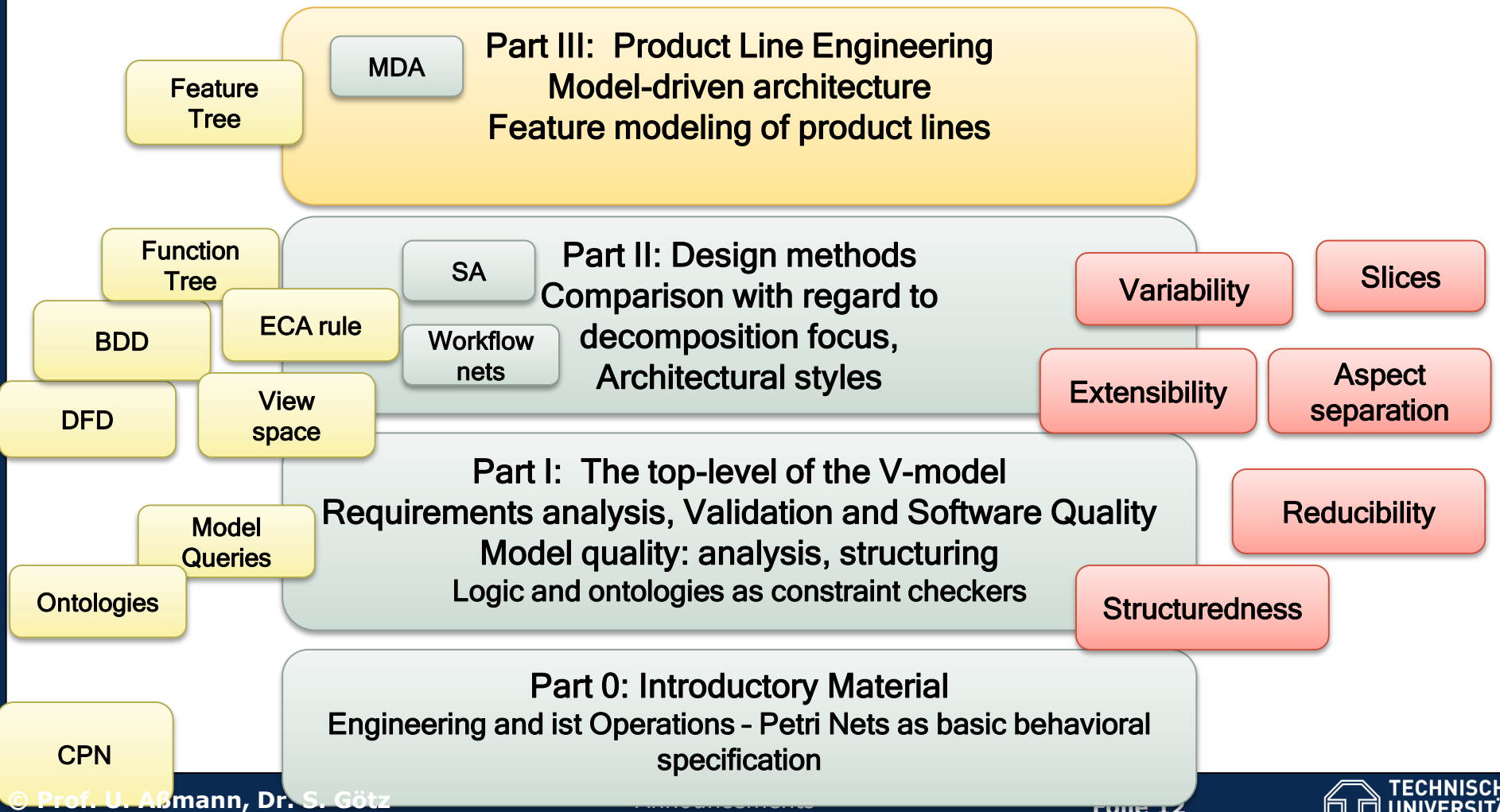
Part III: Product Line Engineering
Model-driven architecture
Feature modeling of product lines

Part II: Design methods
Overview, Comparison of Design Methods with regard to Decomposition focus, Extensibility

Part I: The top-level of the V-model
Requirements analysis
Validation and Software Quality
Model quality: analysis, structuring

Part 0: Introductory Material
Engineering - Petri Nets

Course Structure: Learning Everything for Engineering Product Lines



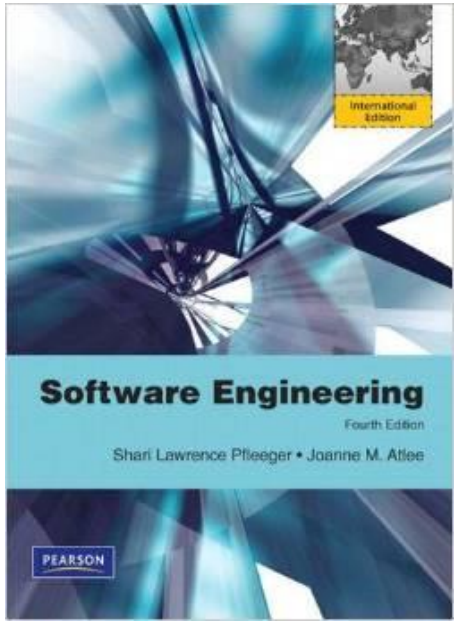
LITERATURE

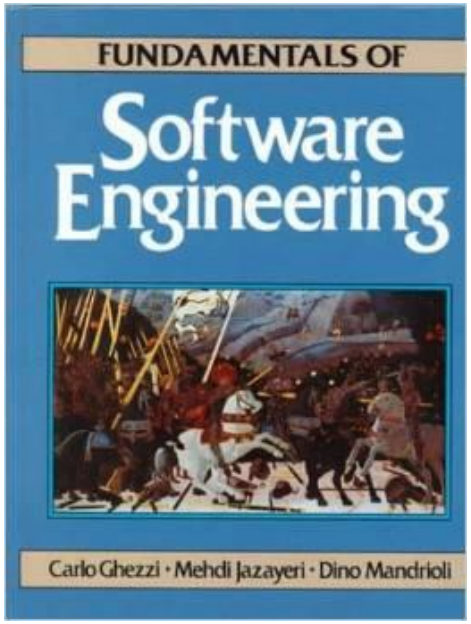
Recommended Literature: Overview Books

- **We recommend one of (reading instructions can be followed in one of them):**
  - Helmut Balzert, Lehrbuch der Softwaretechnik, 2. Auflage. Heidelberg, 2000, ISBN 3-8274-0042-2 (deutsch)
  - Bernd Brügge, Allen H. Dutoit, Objektorientierte Softwaretechnik, Pearson Studium
  - L. A. Maciaszek, B. L. Liong. Practical Software Engineering. A Case Study Approach. Addision-Wesley. Modern book on SE, UML in action in several case studies.
- **Other good books, priority from top to bottom:**
  - Ghezzi, Jazayeri, Mandrioli. Fundamentals of Software Engineering. Prentice Hall. Nice fundamented book. No fuzz, concrete.
  - S. Pfleeger: Software Engineering – Theory and Practice. Prentice-Hall. Good book, not too deep, but broad.
  - Van Vliet: Software Engineering. Wiley.
  - R. Pressman. Software Engineering – A Practitioner's Approach. McGrawHill

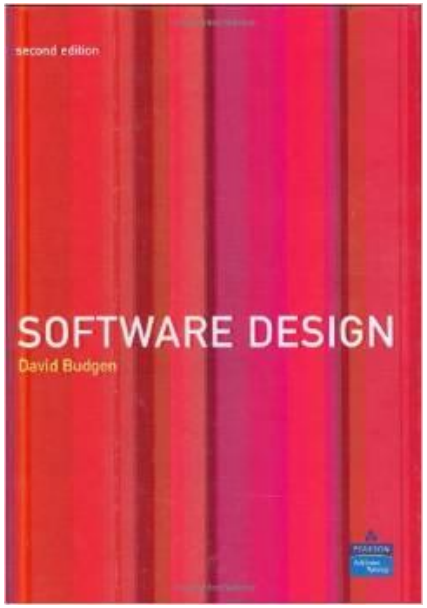
Some Chapters Have Obligatory Readings

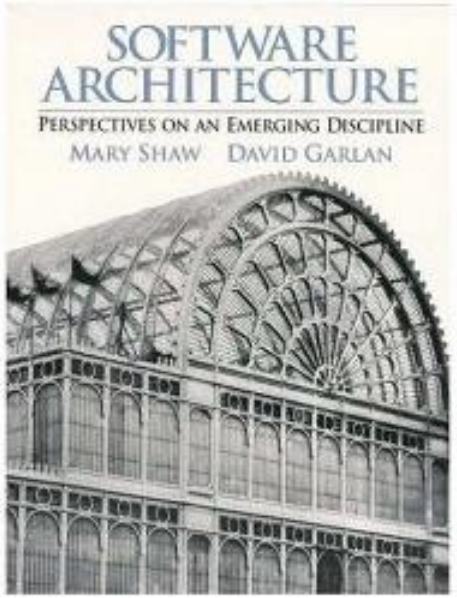
- **S. L. Pfleeger and J. Atlee: Software Engineering: Theory and Practice. Pearson. 2009.**
  - Chapter 5 (Designing the Architecture)
- **C. Ghezzi, M. Jazayeri and D. Mandrioli: Fundamentals of Software Engineering. Prentice Hall. 1992.**
  - Chapter 4 (Design and Software Architecture)





- **D. Budgen:**
  Software Design (2nd Edition).
  Addison-Wesley. 2003.
- **M. Shaw and D. Garlan:**
  Software Architecture: Perspectives on an Emerging Discipline.
  Prentice Hall, 1996.





Recommended Books on UML – Unified Modeling Language

- **UML is required. It is expected that you learn UML yourself from a good book.**
- **We recommend one of:**
  - Online documentation on www.omg.org/uml
  - H. Störrle. UML für Studenten. Addison-Wesley (cheap, good!).
  - Leszek A. Maciaszek. Requirements Analysis and System Design – Developing Information Systems with UML. Addison-Wesley. Excellent concept book.
  - Object Management Group (OMG). UML - Unified Modeling Language. 2.0.
- **Other excellent books:**
  - Ken Lunn. Software development with UML. Palgrave-Macmillan. Many case realistic studies.

- R. Thayer, A. McGettrick. Software Engineering: A European Perspective. IEEE Press. Good collection of papers.
- M. Dorfman, R. Thayer. Software Engineering. IEEE Press. Good collection of papers.
- John McDermid. Software engineer's reference book. Butterworth-Heinemann. ISBN 0-7506-0813-7.
- A. Endres, D. Rombach. A Handbook of software and systems engineering - Empirical observations, laws and theories. Addison-Wesley. Very good collection of software laws. Nice!

- **E. Gamma et al., Design Patterns, Addison-Wesley, ISBN 0-201-63361-2.**
  - This standard reference book belongs to the bookshelf of every software engineer!
  - Buy this now, if you want to visit “Design Patterns and Frameworks”.
- **Others**
  - Rumbaugh et al. Object-oriented modelling and design. Prentice-Hall.
  - Booch. Object-oriented Analysis and Design. Addison-Wesley.
  - In German: Heide Balzert. Objektorientierten Systemanalyse. Spektrum der Wissenschaft.
  - Prieto-Diaz/Arango, Domain Analysis and Software Systems Modelling, IEEE Computer Society Press tutorial, ISBN 0-8186-8996-X, 1991

- C. Szyperski: Component Software. Addison-Wesley
- K. Czarnecki, U. Eisenecker: Generative Programming. Addison-Wesley
- U. Aßmann. Invasive Software Composition. Springer.

- B. W. Boehm, Software Risk Management, 1989
- F. Brooks, The Mythical Man-Month, Addison-Wesley, 1975
- G. Weinberg, The Psychology of Computer Programming, Computer Science Series, 1971.
- E. Yourdan: The Death March.
- P. Neumann: Computer Risks, Addison-Wesley 1995.
- David Thielen. The 12 simple secrets of Microsoft McGraw-Hill.
- Dana Sobel. Longitude. About John Harrison. Just a good book about an excellent engineer.
- Simon Singh. Fermat's last theorem. Just an excellent book about an excellent mathematician (Wiles) thinking excellently hard.

- **J.L. Bentley, Programming Pearls, Addison-Wesley, 2. Auflage 1989, ISBN 0-201-10331-1**
- **J.L. Bentley, More Programming Pearls, Addison-Wesley, 1988, ISBN 0-201-11889-0**
- **J.L. Bentley, Writing Efficient Programs, Prentice-Hall, ISBN 0-13-970244-X, 1982**

- Uwe Viggenschow. Objektorientiertes Testen und Testautomatisierung in der Praxis. Konzepte, Techniken und Verfahren. Dpunkt-Verlag, Heidelberg. www.oo-testen.de. Nice practical book on testing.
- P. Liggesmeyer. Software-Qualitätsmanagement. Verlag Spektrum der Wissenschaften, Heidelberg.
- Boris Beizer: System Testing and Quality Assurance,Van Nostrand Reinhold, New York, 1984, ISBN 0-442-21306-9
- Glenford J. Myers, The Art of Software Testing, 1979
- Nesi (ed.), Objective Software Quality, 1995, Springer LNCS 926, ISBN 3-540-59449-3
- N. Fenton, S.L. Pfleeger. Software Metrics – a rigorous and practical approach. PWS Publishing.