



**TECHNISCHE  
UNIVERSITÄT  
DRESDEN**

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

# Softwaretechnologie II

**Prof. Dr. Uwe Aßmann**  
**Technische Universität Dresden**  
**Institut für Software- und Multimediatechnik**  
**Gruppe Softwaretechnologie**  
**<http://st.inf.tu-dresden.de/teaching/swt2>**  
**WS 15/15-0.3, 13.10.15**

- **Vorlesung: Mi 11:10 E023**
  - Prof. Dr. Uwe Aßmann, Nöthnitzer Str. 46, 2. OG, Raum 2087, West
  - Katrin Heber, Sekretärin. 0351 463 38 463
  - Sprechstunde Do, 11:00-13:00. Bitte bei Frau Heber anmelden:
  - Email [katrin.heber@tu-dresden.de](mailto:katrin.heber@tu-dresden.de). Bitte über Frau Heber kontaktieren, da emails an Prof. Aßmann oft nur verzögert beantwortet werden können
- **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: Dr. Sebastian Götz**
  - Übungen können nur einen kleinen Teil der Vorlesung abdecken
  - Ab Woche 2
  - Semester ist in Komplexe aufgeteilt:
    - Ontologien
    - Anforderungsanalyse: ZOPP, Lasten- und Pflichtenheft
    - Testen Regressionstest
    - Reuseware

- **Teilung der Übungsgruppen in kleine Gruppen á 4-5 Personen**
- **Zumeist 2-3 Wochen Zeit zur Bearbeitung eines Komplexes**
- **Lösungen werden ins SVN eingecheckt und dann bewertet**
  - Nacharbeitung möglich
- **Alle Übungskomplexe müssen bearbeitet werden**
  - → Ansonsten Prüfung nur möglich als 2/0/0 Prüfung
- **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

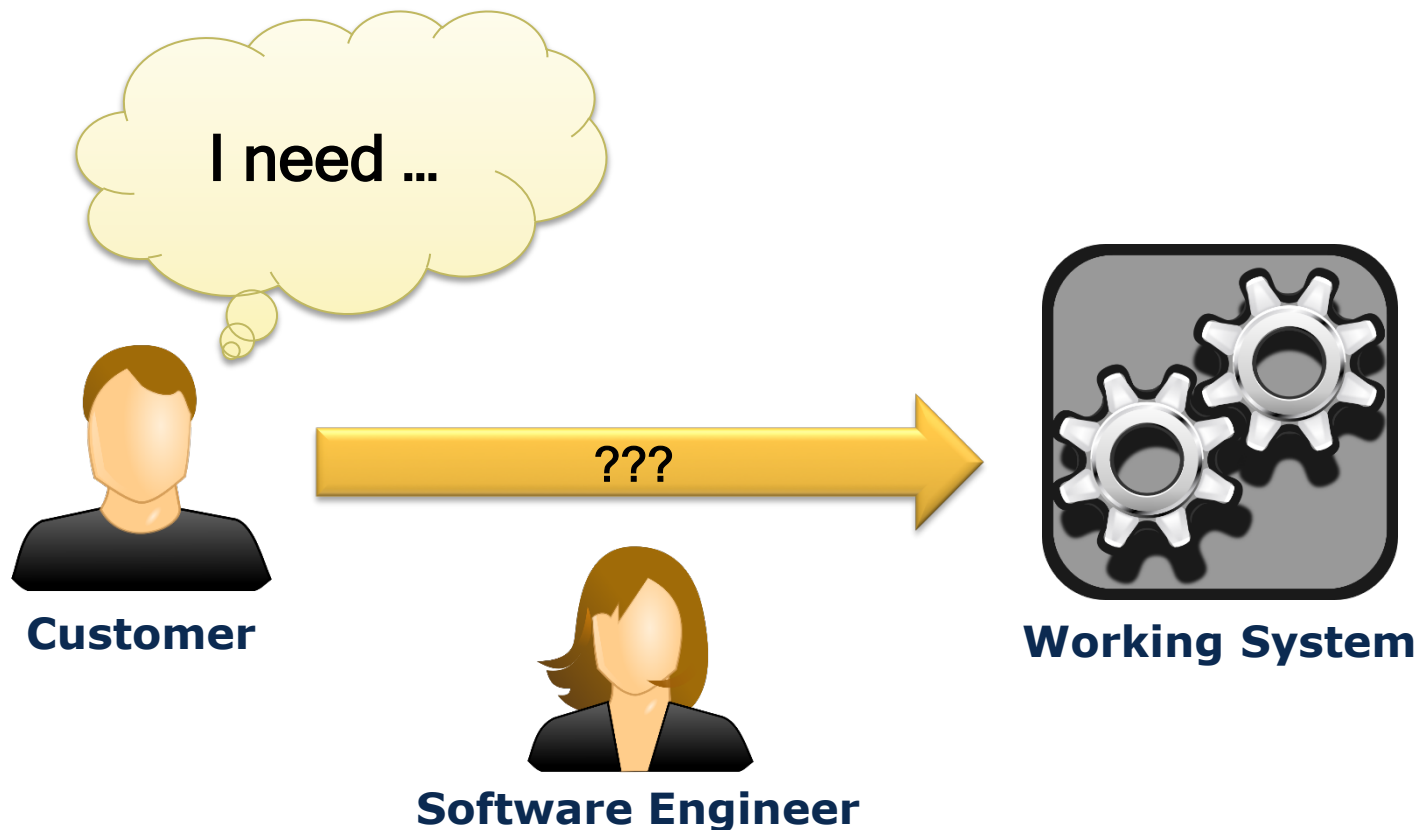


# Remarks on the Nature of the Course

▶ **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**



- ▶ **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**



## Softwaretechnologie II (Bachelor)

Modellierung, Entwurfsmethoden,  
Produktlinien, Geschäftsmodelle (WS)

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

**Academic Skills in  
Computer Science**  
Wie man wissenschaftlich arbeitet  
(WS)

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

**Software-Management**  
Wie man Projekte macht (SS)

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

**Design Patterns and  
Frameworks**  
Architektur objektorientierter Systeme  
(WS)

**Software as a Business**  
(WS)  
How to develop a business model and a  
startup

Automotive Software  
Engineering  
(Prof. Hohlfeld)  
(SS)

**Component-Based  
Software Engineering**  
Produktlinien mit anderen  
Komponentenmodellen (SS)

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

- ▶ **Design Patterns and Frameworks (WS)**
  - Basic design patterns
  - Design patterns in frameworks
  - Role-based design
  - Composition of design patterns
  - Layered frameworks
- ▶ **Requirements Engineering und Testen (Dr. Demuth, WS)**
  - ▶ ISTQB-Level 1
- ▶ **Component-based Software Engineering (SS)**
  - Black-box component models (e.g., EJB)
  - Grey-box component models (e.g., Aspects)
  - Software composition
- ▶ **Model-Driven Software Development in Technical Spaces (MOST) (WS)**
  - ▶ Metamodelling, technological spaces, domain-specific languages
- ▶ **Software-Management (SWM) (SS)**
- ▶ **Automotive Software Engineering (ASE, Prof. Hohlfeld, SS)**
- ▶ **Academic Skills for Software Engineers (ACSE) (SS)**
- ▶ **Software Architecture (Dr. Götz, SS)**

**Part IV: Selling Software**  
Business models

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

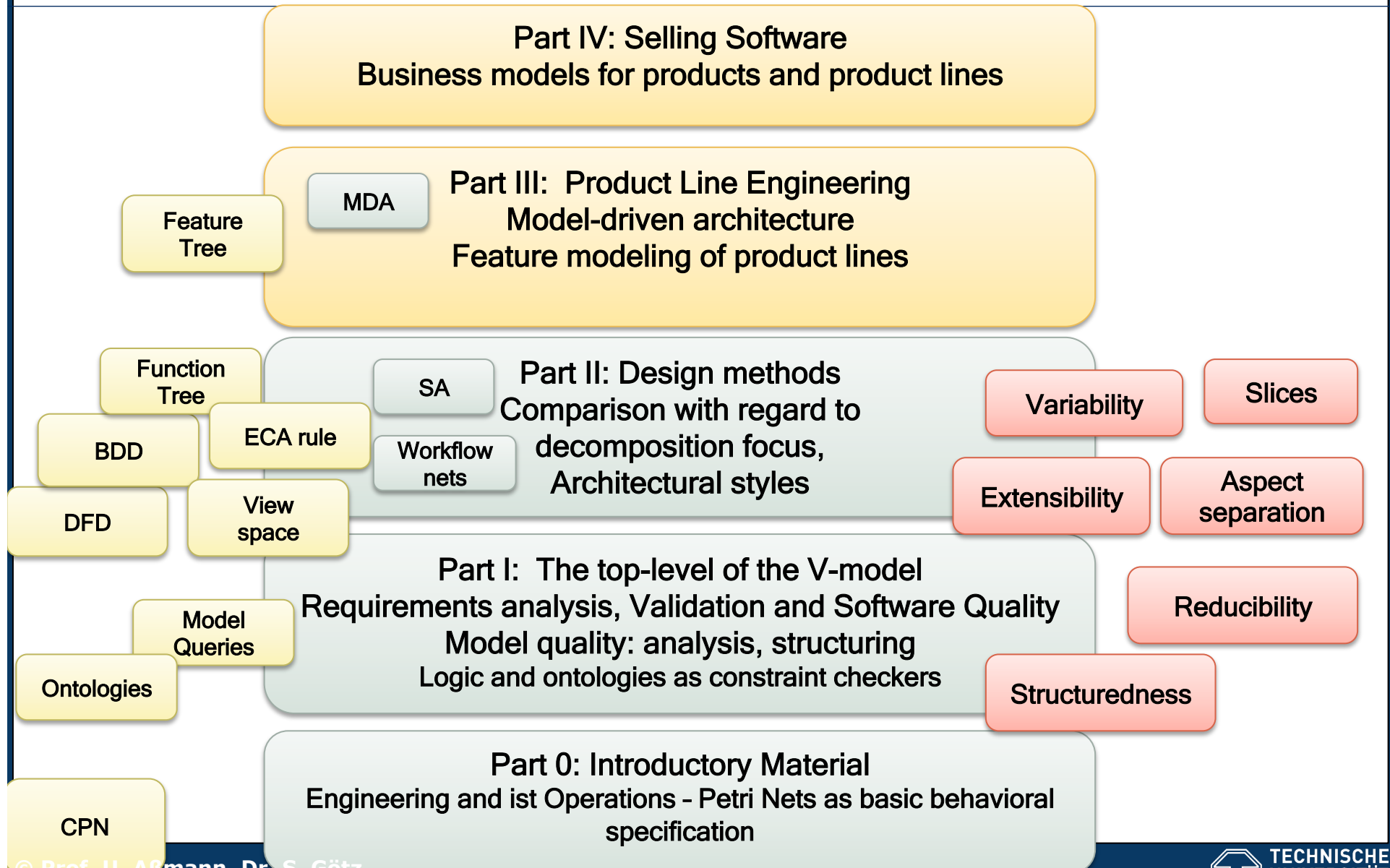
**Part II: Design methods**  
Overview, Comparison of Design Methods with  
regard to Decomposition focus, Extensibility

**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

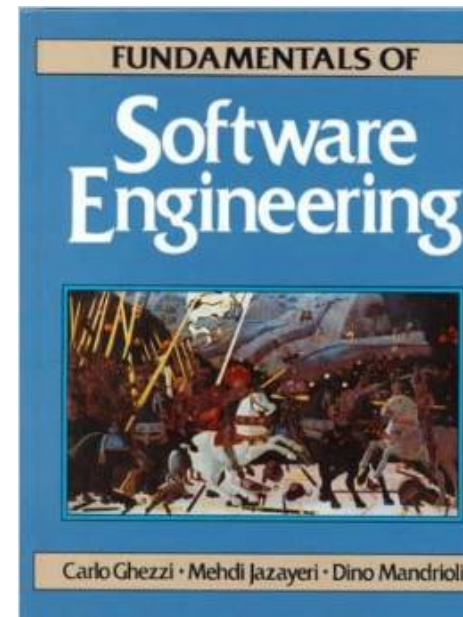
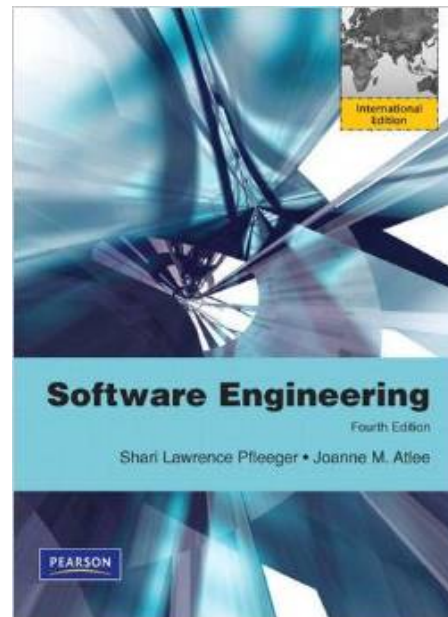
▶ **We recommend one of (reading instructions can be followed in one of them):**

- 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. Liang. Practical Software Engineering. A Case Study Approach. Addison-Wesley. Modern book on SE, UML in action in several case studies.

▶ **Other good books, priority from top to bottom:**

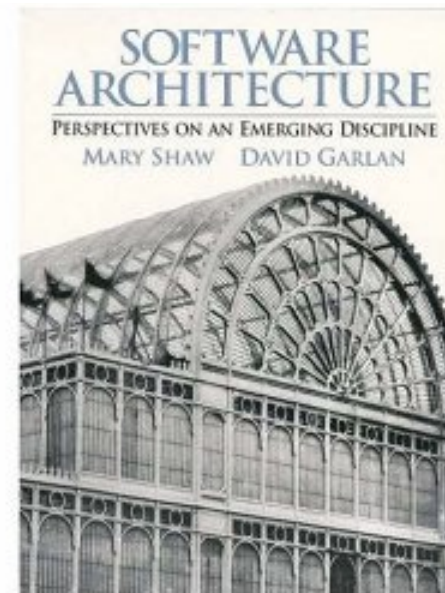
- Ghezzi, Jazayeri, Mandrioli. Fundamentals of Software Engineering. Prentice Hall. Nice fundamented book. No fuzz, concrete.
- S. Pfleeger: Software Engineering – Theory and Practice. Prentice-Hall. Good book, not too deep, but broad.
- Van Vliet: Software Engineering. Wiley.
- R. Pressman. Software Engineering – A Practitioner’s Approach. McGrawHill

- **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.**





- ▶ **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](http://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](http://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.**





- ▶ **Version control with subversion. <http://svnbook.red-bean.com/>, also available as paper book of O'Reilly**
- ▶ **Sommerville (ed.), Software Configuration Management, 5. ed., 1996**
- ▶ **David Whitgift, Methods and Tools for Software Configuration Management, Wiley, 1991, ISBN 0-471-92940-9**

▶ **On Writing:**

- A. Franklin Parks, J. A. Levernier, I. Masters Hollowell. Structuring Paragraphs and Essays – A Guide To Effective Writing. Bedford/St. Martin's. [www.bedfordstmartins.com](http://www.bedfordstmartins.com). Very good book.

▶ **Fogler/LeBlanc, Strategies for Creative Problem Solving**