

# Model-Driven Software Development in Technical Spaces (MOST)

- aka Software Factories -

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DRESDEN  
concept  
Exzellenz aus  
Wissenschaft  
und Kultur

# Relation of the Course to Modules

The course can be used for the following modules:

- ▶ Diplom Informatik: INF-BAS3, INF-VERT3
- ▶ Master Informatik: INF-BAS3, INF-VERT3
- ▶ Bachelor Medieninformatik: INF-B-540
- ▶ Master Medieninformatik: INF-BI-4, INF-BI-5
- ▶ Diplom IST: IST-B-321
- ▶ Diplom Informatik (2004): INF-04-FG-SWT
- ▶ Diplom Informatik (2004): FG 4 SE

For other programs, special rules may hold; consult the manuals of your "Nebenfach".

# 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)

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

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

**Automotive Software Engineering (Prof. Hohlfeld)**  
(SS)

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

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

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

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

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

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

# Central Topics of the Course

## 4 Model-Driven Software Development in Technical Spaces (MOST)

9. Modeling Islands, Modeling Villages and Technical Space Bridges are important for heterogeneous software development

**Transformation Bridge  
Adapter Bridge**

8. Process Engineering and Method Engineering

7. Megamodels (with model mappings) for Quality Management

**MDA OSM HYPS  
Vitruv ROSI**

6. Alternative Metapyramids of Technical Spaces

5. Metamodel composition

4. Generic Tools in a Technical Space (Reducible metamodels, Querying, Abstract Interpretation, logics for analysis and consistency, TRS, GRS, Port GRS for transformation)

3. Metamodel-based environments

**EMFText eMOFlon**

2. Technical Spaces do have the same components and tools, language mappings, model algebrae, model composition systems

1. Metamodels structure data, models and programs  
Decidable metamodels, Tool Metamodels  
Tool Construction and -Generation in a TS

**EMOF MOF EMOF  
CROM Melanie**

0. Applications of MDSD: Design tools of complex systems  
Design tools for CPS

# MDSD and Software Factories

- ▶ MDSD is the engineering of applications with several related models (inclusively code), based on systematic engineering of metamodels (languages) in technical spaces.
- ▶ How are models related?
  - Model cover by matching rules
  - Model mappings
  - Model transformations
- ▶ How are the languages related?
  - By mapping
  - By role fattening

# Engineering of Technical Spaces, Megamodels, and Software Factories

- ▶ Def.: A *megamodel* is a set of systematically related models.
- ▶ Engineering of Technical Spaces and Megamodels is one of the most important topics of the future of software and systems development
- ▶ Dresden has modern technologies and tools based on megamodels
  - Role-and context-based languages
  - Invasive composition
  - Metacomposition tools (Reuseware, SkAT)
  - Round-Trip Engineering and Role-based tools

## Teil I: Grundlagen

- ▶ 1. Modeling
- ▶ 2. MDSD Applications
- ▶ 3. Tools and Materials Pattern Language (TAM)
  - Roles and collaborations
- ▶ 4. Metamodeling in the (E)MOF technical space
  - The Technical Space House
- ▶ 5. Bridging the TS Grammarware and EMOF with EMFText
- ▶ 6. Tool architecture
  - Repositories
  - Role modeling and the Role-Object Pattern
- ▶ 7 Megamodels

- ▶ Part II Technical spaces
- ▶ 20. Grammarware
  - Parser generators
  - Text algebrae
- ▶ 21 Treeware
  - Query
- ▶ 22 Deep Analysis in Treeware
  - Abstract interpretation
- ▶ 23 Link-Treeware
  - XML, JSON, Xcerpt
- ▶ 24 Flat Analysis in Graph- and Modelware
  - Semmle .QL, TGraphQL
- ▶ 25 Deep Analysis in Graphware
  - Reachability
- ▶ 26 Graph and Model Transformations
- ▶ 28. MOFLON as example

# Outline Part III-VI – Architecture of Software Factories

## Part III: Architecture and Composition of Tools to Applications

- ▶ 30. Architecture
  - Tool integration
  - Exchange formats
  - Bridges between technical spaces
  - Composition of stream-based tools
- ▶ 31. Role-based composition of languages for the composition of materials
  - And tools
- ▶ 32. Stream-Based integration
- ▶ 33. MetaCASE tools (MetaEdit+)
- ▶ 34. MOFLON

- ▶ Part IV: 1-TS Software Factories
  - 40. Requirements and Test Management in ReDeCT
  - 41. Model-Driven Architecture
  - 42. Documentation
- ▶ Part V: Synchronization and Round-Trip Engineering
  - 40. Round-Trip Engineering
  - 41. Triple Graph Grammars
  - 42. Orthographic Software Modeling
- ▶ Part VI: Multi-TS Software Factories
  - 60. The MOST factory
  - 61. Conclusion



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# ST Works in the Last Years

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