
CO7214 Service-Oriented Architectures

Credits: 15 **Convenor:** Prof. R. Heckel **Semester:** 2nd

Prerequisites: *Desirable: UML, XML, Java*

Lectures: 24 hours

Surgeries: 8 hours

Laboratories: 8 hours

Independent Study: 72.5 hours

Assessment: *Coursework: 40% + Two hour exam in May/June: 60%*

Subject Knowledge

Aims The aim of this module is to give students knowledge and skills in the principles and functions of service-oriented systems and their applications, as well as in their development based on UML, XML and Java. This shall enable them to use such technologies in practice or to embark on further research in this area.

Learning Outcomes Students should be acquainted with the conceptual and technological foundations of Service-Oriented Architectures (SOA), i.e.

- the motivation, basic mechanisms, and open problems of SOA;
- service-oriented development and its relation to object-oriented and component-based development;
- the realisation of SOA using on XML-based and Web service technology.

Methods Class sessions with course notes, labs, recommended textbooks, and worksheets.

Assessment Multiple choice and short answer tests, written examination.

Skills

Aims The module shall provide the basic skills required to develop SOAs in practice.

Learning Outcomes Students should be able to create and understand descriptions of services and systems using both high-level models and XML-based languages, including

- UML models of service-oriented applications at different levels of abstraction;
- the mapping of models to implementations in Web services, XML and Java;
- the model-based testing of service implementation;

Methods Worksheets with modelling, mapping and testing exercises.

Assessment Modelling, mapping, and testing assignments in coursework and written examinations.

Explanation of Prerequisites Basic knowledge of XML, UML, and Java will be helpful.

Module Description A Web service is an application component deployed on a Web accessible platform, provided by a service provider to be discovered and invoked over the Web by a service requestor. Service-oriented architectures, the underlying architectural style of Web services, combine ideas from component-based and distributed systems, adding the idea of services as loosely coupled components that may be discovered and linked at runtime. Applications range from enterprise application integration, via electronic commerce, to dynamic e-business scenarios and the Internet of Things.

The lecture shall give an introduction to two basic technologies that underly Web services, XML and SOAP-based services as well as REST services, and present a systematic, model-based development approach using the UML. This includes the specification of service interfaces by means of UML diagrams, the systematic (and partly automatic) generation of the corresponding service descriptions, the implementation of services and their clients in Java and the model-based testing of services.

Syllabus In detail, the module will cover the following topics.

- Motivation and Concepts of SOA;
- Modelling XML Languages with UML;
- Model-Based Data Integration using XSLT;
- XML-based Messaging using SOAP;
- Describing and Publishing Web Services using WSDL and UDDI;
- Processes for Web Services based on BPEL4WS;
- Web Services and Semantic Web technology;
- Model-based testing of Services;

Reading List

- [A] Francisco Curbera, Frank Leymann, Tony Storey, Donald Ferguson, Sanjiva Weerawarana, *Web Services Platform Architecture: Soap, WSDL, WS-Policy, WS-Addressing, WS-Bpel, WS-Reliable Messaging and More*, Prentice Hall. 2005.
- [A] Tom Pender, *UML Bible*, Wiley Publishing Inc, 2003.
- [A] Martin Fowler, Kendall Scott, *UML Distilled: A Brief Guide to the Standard Object Modeling Language*, Object Technology S., 2003.

Resources Course notes, web pages, study guide, worksheets, handouts, lecture rooms with data projector/OHP.

Module Evaluation Course questionnaires, course review.