Module title Modeling and Verification				
Module code tba	**Level** Master (MSc.)	**Hours per week** 4	**ECTS credits** 5	**Duration** 1 semester
Module instructor Prof. Dr. Kern	**Lecture type** Lectures and assignments Practical courses	**Prerequisite(s)** Basic knowledge in the Java programming language, and knowledge in software engineering	**Grading** Exam at the end of the semester	

Objectives

- Participants will be able to independently understand, model, implement and execute business processes.
- Participants will be able to select and create models for different purposes and to evaluate the use of different models for given problems
- Participants deepen their knowledge in implementing web services using the OO programming language Java and their integration into business processes.
- Participants will be able to formally understand and model distributed systems using advanced modeling notations (such as, e.g., EPCs, Petri nets, communicating automata, transition systems etc.).
- Participants remember the syntax and semantics of discussed logics and are able to deduce own formulas for given problems.
- Participants are able to apply tools like model checkers to verify properties (specified in logics) on given systems.

Content

- Business process modelling using BPMN and tools,
- Understanding BPMN, design process with gateway, lanes, events, sub processes, pools and message flow etc.
- Execution and implementation of business processes and web services using a BPMN process engine,
- Modeling using EPCs,
- Theory and modeling of Petri nets, application of Petri Nets, Colored Petri Nets
- Comparison of and transformation into different modeling languages
- Theory and modeling of message passing systems (MSCs, MSGs, CFMs)
- Modeling using logics like OCL (Object Constraint Language), PDL (Propositional Dynamic Logic) and temporal logics (CTL, LTL, CTL*)
- Formal verification using above logics, model checking techniques and -tools

Textbook/teaching material

Amongst others the following literature will be used during this course:
English:

- Wil van der Aalst, Christian Stahl: Modeling Business Processes, A Petri Net-Oriented Approach (2011)
- Object Management Group (OMG): Object Constraint Language (V2.4, 2014)
- Michael Huth, Mark Ryan: Logics in Computer Science (2018)
- Christel Baier, Joost-Pieter Katoen, Principles of Model Checking (2008)

German:

- Jakob Freund, Bernd Rücker: Praxishandbuch BPMN 2.0 (2014)
- Wolfgang Reisig: Petrinetze: Modellierungstechnik, Analysemethoden, Fallstudien (2010)

Note: this is not the official course descriptor according to the “Studien- und Prüfungsordnung” (SPO)