

# Simulation and Modeling I

WS 2019/2020

## Contents and Organization

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Prof. Dr.-Ing. Reinhard German

M.Sc. Lisa Maile, M.Sc. Daniel Scharrer

Friedrich-Alexander Universität Erlangen-Nürnberg

Informatik 7 (Rechnernetze und Kommunikationssysteme)



# Audience, Language, Lecturer

## ■ Audience

- computational engineering, bachelor/master
- computer science (Informatik)
- mechanical engineering (Maschinenbau)
- ...

## ■ Language

- lectures (Vorlesungen) and exercise classes (Übungen) are given in English (individual conversation in German always possible)
- all material is in English

## ■ Lecturer

- Prof. Dr.-Ing. Reinhard German
- exercise classes:  
M.Sc. Lisa Maile, M.Sc. Daniel Scharrer

## ■ Link: <https://www.cs7.tf.fau.eu/teaching/sam1-2019w/>

# Contents

## Lectures

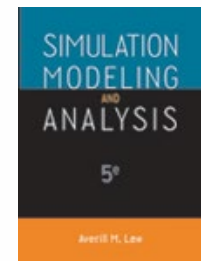
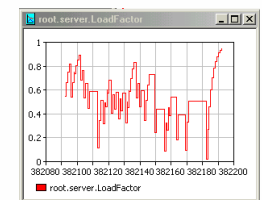
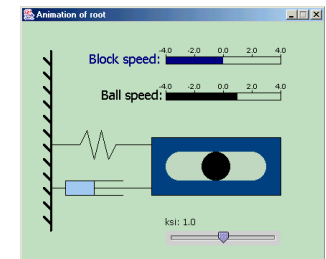
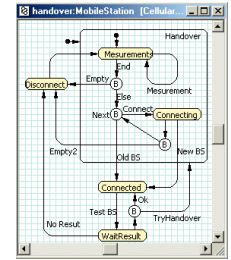
- Introduction to Simulation
- Discrete Simulation
- Analytical Modeling
- Modeling Paradigms (e.g., event/process oriented, queueing systems, Petri nets, UML statecharts)
- Input Modeling (e.g., Distribution Fitting)
- Random Number Generation
- Output Analysis
- Continuous and Hybrid Simulation
- Simulation Software

## Exercises

- Refresher on Probability Theory (as needed for Simulation)
- Practical experience with various simulation tools

## Sources

- Averill Law: "Simulation Modeling and Analysis", 5th ed., McGraw Hill, 2014
- Additional material can be found on the homepage



# Contents (cont.)

## ■ Exercise classes

- exercises on Tuesday and Thursday
- practice of theory, usage of various tools
- exercise classes for preparation of assignments
- partly used as supervised computer hours
- work on assignments in teams

## ■ 7 Assignments

- Computing with probabilities I, II
- Modeling in UML with AnyLogic / Coding simulation with SSJ
- Petri net modelling
- Holiday Project – Create your own Simulation
- Data measurements and distribution fitting with ExpertFit
- Simulation control in AnyLogic
- Hybrid simulation with AnyLogic

# Organization

- Lectures: **Thursday, 14:15-15:45, KS I** (Cauerstraße 4)
- Exercise classes, computer hours
  - exercise classes: (start on October 22)
    - Tuesday, 12:15-13:45 or 16:15-17:45, room 04.158 (Martensstr 3)
    - Thursday, 8:15-9:45 room 01.153-113 (Martensstr 3)
  - please register yourself for the course via StudOn and subscribe for an exercise class
  - registration for exercises begins today (October 17) at 20:00 (8PM)

# Organization (Access data)

## ■ StudOn registration

- first, register for the course using the password below,  
StudOn Path: 5.Tech -> 5.3 INF -> INF7 -> SimMod 1 WS19/20
- thereafter, follow "Subscribe for a class" to set your priorities for classes
- places will be filled by lot after equal chances registration period is closed

## ■ Lecture's website

- lecture slides, exercise notes, assignments, news, examination questions

## ■ link: <https://www.cs7.tf.fau.eu/teaching/sam1-2019w/>

- to access downloadable content use:
  - login: **sm1**
  - password: **Sim+Mod1w19**

# Organization (cont.)

## ■ Examinations

- all assignments successfully completed
- oral (30 minutes)/written (90 minutes) examination after semester
- and on demand written certifications with or without grade

Questions?

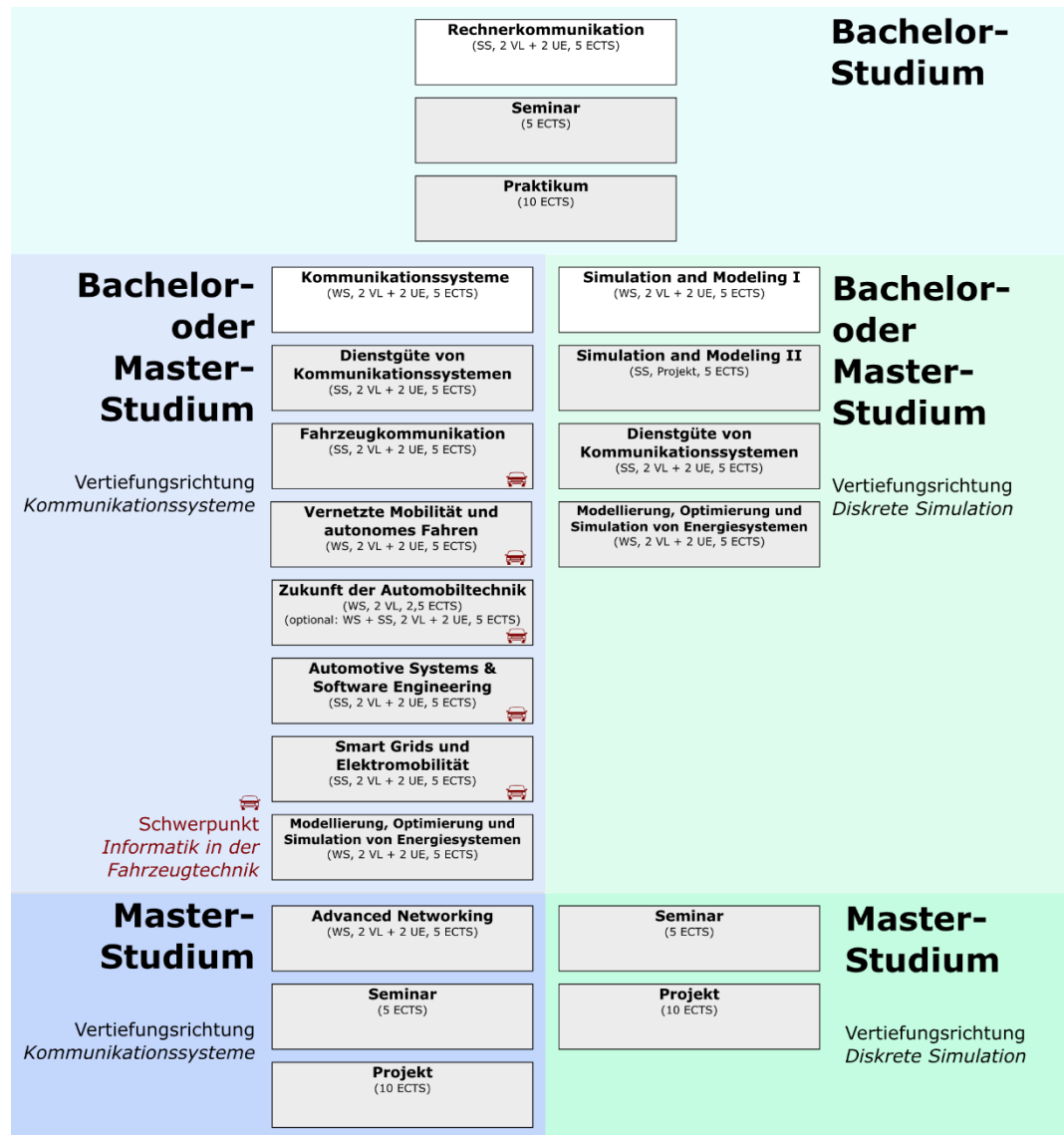
# Combination with other lectures at Informatik 7

## ■ Simulation and Modeling II in summer semester

- Project-oriented: teams of three/four
  - project management, presentation, documentation, case studies
  - advanced topics: parallel and distributed simulation, variance reduction techniques, rare event simulation
- Simulation projects
  - former projects: traffic intersection, gas station, bus line, street/garden cafe, university cafeteria, supermarket, drinks terminal, Ferris wheel at Bergkirchweih, ambulance station, smartphone energy management, energy costs for houses with photovoltaics and battery, energy demand of plug-in-hybrid vehicles, industrial Ethernet ...
  - own project ideas are possible



# Combination with other lectures at Informatik 7



## Furthermore ...

- ... please do not use laptops or other smart devices during my lecture – thank you!