

<b>Modul – No.</b>	<b>255</b>	<b>Mandatory</b>	
<b>Module name</b>	<b>Distributed Systems</b>		
Module coordinator	Prof. Dr. Mario Schölzel		
Title	Distributed Systems		
Title of examination	Distributed Systems		
Semester	5		
Course Type	Language	Lecture including exercises	English
SWS/ ECTS/ Workload	2 V / 2 P	5	150
Requirements for attendance	None		

<b>1. Content and objectives</b>			
<b>Content:</b>			
<ol style="list-style-type: none"> <li>1. Types and Basics of Distributed Systems</li> <li>2. Architecture models and examples of distributed systems</li> <li>3. Processes and threads and their application in concurrent distributed systems</li> <li>4. communication oriented middleware <ol style="list-style-type: none"> <li>a. General concepts</li> <li>b. Messages, MPI</li> <li>c. RPC/RMI</li> </ol> </li> <li>5. Inter-process communication and –coordination in distributed systems <ol style="list-style-type: none"> <li>a) time synchronization</li> <li>b) choice algorithms</li> <li>c) mutual exclusion and synchronization</li> </ol> </li> <li>6. Application oriented middleware <ol style="list-style-type: none"> <li>a) Java EE</li> <li>b) Organization of persistence</li> <li>c) Organisation of transactions</li> </ol> </li> </ol>			
<b>Objectives:</b>			
After successful completion of the course the students			
<ul style="list-style-type: none"> <li>• The students understand fundamental problems in distributed systems</li> <li>• They know techniques to overcome these problems</li> <li>• They recognize advantages and disadvantages of various solutions</li> <li>• They are able to develop and implement simple communication-oriented distribute applications using basic operating systems primitives as well as middleware mechanisms.</li> <li>• They understand the basic concepts of application oriented middleware platforms</li> <li>• Students can apply their English language skills</li> </ul>			
<b>Recommended Literature:</b>			
<ul style="list-style-type: none"> <li>• M. van Steen and A.S. Tanenbaum, Distributed Systems, 3rd ed., 2017.</li> <li>• Coulouris, Dollimore &amp; Kindberg: Distributed Systems – Concepts and Design. 4. Auflage, Addison Wesley</li> <li>• C. Baun, M. Kunze, J. Nimis, S. Tai: Cloud Computing: Web-basierte dynamische IT-Services Springer-Verlag, 2011</li> <li>• K. Hwang, J. Dongarra, G. Fox: Distributed and Cloud Computing Morgan Kaufmann, 2011</li> <li>• William Gropp, Ewing Lusk, Anthony Skjellum: Using MPI, Portable Parallel Programming with the Message-Passing Interface, Third Edition, Scientific and Engineering Computation, 2014.</li> <li>• Simon Hoffmann, Rainer Lienhart, OpenMP - Eine Einführung in die parallele Programmierung mit C/C++. Berlin: Spring, 2008. ISBN 978-3-540-73123-8</li> <li>• Alexander Salvanos: Professionell entwickeln mit Java EE 8, Rheinwerk Verlag Bonn, 2. Auflage, 2018.</li> </ul>			
<b>2. Methods of instructions</b>			
Lecture and practices.			
<b>3. Requirements for attendance</b>			
No course specific requirements.			
<b>4. Usability of this module</b>			
The module is offered as mandatory course in the Bachelor study course „Computer Engineering“ as well as course in qualification semester of the master course “Computer Engineering for IoT Systems”.			

**5. Requirements for assessment**

Assessment is performed either as written examination (90 minutes) or oral examination. Students need to pass the module examination, which encompasses all contents of the lecture. Examination in the Bachelor course is offered in German Language.

**6. ECTS credits**

5 ECTS credits

**7. Frequency of offer**

Every winter term

**8. Work load**

150 h of total work load, from:

- 45 h of presence at lectures/exercises
- 55 h of self-study
- 50 h of preparation for examination

**9. Duration of module**

1 semester